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***PROCESSES OF ENTERPRISE TRANSFORMATION: NEW BUSINESS MODELS AND DISRUPTIVE INNOVATION EFFECTS IN THE MUSIC INDUSTRY***

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**TESIS DOCTORAL**

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## *PROCESSES OF ENTERPRISE TRANSFORMATION: NEW BUSINESS MODELS AND DISRUPTIVE INNOVATION EFFECTS IN THE MUSIC INDUSTRY*

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Tesis doctoral presentada por **Vasileios Myrthianos**

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**Granada, 2013**

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To my Family.

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# SUMMARY

The music industry has suffered radical innovations from the final of the 90's such as broadband internet and MP3 which changed the conditions of the market, opening the possibility to music consumers to store files in their computers and share them with peers. This activity is commonly described as piracy and as a general rule violates the rights of Intellectual Property Rights (IPR) holders. However, it is difficult to regulate and despite of several efforts conducted by European and US governments is still common practice among consumers all over the world. It is worth noticing that the study of this process of digitalization is also instructive for other creative industries like cinema or books.

As it is described in this PhD dissertation there is an increasing stream of research in the area of music industry, in which two research questions seem to be predominant. First, how large is the size of the piracy activity all over the world and how it affects the industry? And second which is the reaction of the industry in terms of new digital business models and which is its performance? This PhD dissertation modestly contributes to shed some light on these questions through the exploitation of unique databases and novel methodologies. In particular, this PhD has benefited from extensive surveys conducted early 2010 and provided by one of the major licensing firm containing detailed information from more than 44,000 consumers in ten different countries: Australia, Canada, France, Germany, Italy, Japan, Netherlands, Spain, UK, and US. Moreover, this information was complemented with information on sales at country level provided by the International Federation of the Phonographic Industry (IFPI), and information extracted from secondary sources such as indexes of internet and

computer usage from IMD Competitiveness, and information at firm level from SABI and FAME databases.

The PhD starts with a theoretical benchmark model which compares the competitive situation of the music industry before and after the appearance of the P2P networks such as Napster in 1999. Whereas the high concentration of the music industry before P2P makes it reasonable to assume that the industry follows monopolistic patterns, this monopolistic structure has been transformed into a duopoly under price competition for non-homogeneous products, presented in the prior literature as the Bertrand duopoly equilibrium. The theoretical model concludes that, after this change in the competitive structure, the music industry begins to suffer from a dramatic decrease in revenues, profits and consumer surplus.

These introductory analyses reveal that the music industry is struggling with piracy activity. Therefore, our first objective was to quantify the scale of illegal file sharing activity across the 10 countries for which we have survey data. Results show that non-legitimate file sharing activity is a heterogeneous issue across countries. The scale of activity varies from 14 per cent in Germany to 44 per cent in Spain, with an average of 28 per cent. Moreover, we find a negative correlation between piracy rates and music expenditure at country level, result that at some extent validates the negative effect of piracy, formally described in the literature as a purchase substitution effect – consumers substitute legal purchases for illegal downloads. This result is an important call for further regulation in internet. Cultural issues and legal systems also seem to be correlated with piracy, since this first chapter also identifies that a countries' legal origin correlates to data on file sharing activity, with countries from a German legal origin illegally file sharing least.

A paradigmatic result in the first chapter is that illegal file sharers may also make legal purchases –in aggregate terms 46.5 per cent of file sharers purchase music, which begs the question 'why do people purchase when they have access to the resource for free?' The second chapter builds upon transaction cost theory and the economics of property rights and it identifies two possible explanations as to why illegal file sharers may also make purchases: Sample exposure and respect for property rights. Sample exposure implies that file shares are sampling the market using illegal means before purchasing. Respect for property rights makes reference to those file shares that guilt compels them to make a purchase. On the other hand, those file sharers that believe internet information is free and do not have any feel of guilty, described in this PhD dissertation as *Robin Hoods*, are not going to make legal purchases.

Digital markets are shown to suffer from purchase substitution, which creates transaction costs and a loss in potential revenue for resource owners. As consumers are exposed to resource they may be influenced to purchase, however through sample exposure the consumer captures value from the resource owner through learning and purchases only the resources perceived to be of greatest value. Purchase substitution in digital markets is partially alleviated through increasing a consumer's belief in property rights. For file sharers with a likelihood of purchase greater than 60 per cent exposure to resource increases their likelihood of purchase. However, data provides no volume or value for such purchases and data would suggest the value is low. In the physical market consumers behavior is predominantly influenced by their beliefs in property rights.

Creative industries are increasingly providing a number of different product-service offerings using the portfolio of resource, which defines Product-Service Systems (PSS). In the third and final essay it is provided a novel empirical framework to evaluate PSS consumer demand at country level, and consequently give an indication of the

business model problem that the industry is suffering in each country. The results demonstrate that in all the countries analyzed the relative consumer demand for digital format was greater than that which was offered by the industry at the time of data collection. The results identify the different market opportunities which exist, in this case the opportunity to expand the digital offering. The US is identified as the market with a PSS which most closely matches consumer demand. Moreover, we report significant correlations between the level of PSS challenge and legal origin or technological infrastructure. This provides important implications for managers.

# RESUMEN DE LA TESIS DOCTORAL

La industria musical constituye el ejemplo perfecto de sector en el que analizar procesos de cambio empresarial fruto de innovaciones externas que obligan a reconfigurar los modelos de negocio existentes. Esta industria sufrió innovaciones radicales a finales de los 90, como internet de banda ancha y MP3, que cambiaron las condiciones del mercado, abriendo la posibilidad a los consumidores de música para almacenar archivos en sus ordenadores y compartirlos con otros usuarios. Esta actividad se describe comúnmente como piratería y, por regla general, viola los derechos de los titulares de la propiedad intelectual. Sin embargo, es difícil regular la situación y a pesar de varios esfuerzos realizados por los gobiernos europeos y de EE.UU. sigue siendo una práctica común entre los consumidores de todo el mundo. Vale la pena destacar que el estudio de este proceso de digitalización también es instructivo para otras industrias creativas como puede ser el cine o la literatura.

Tal y como se describe en esta tesis doctoral hay un creciente volumen de investigación en el ámbito de la industria musical, en la que dos preguntas de investigación parecen ser predominantes. En primer lugar, ¿cuál es el tamaño real de la actividad de piratería en todo el mundo y en qué forma afecta a la industria? Y en segundo lugar, ¿cuál es la reacción de la industria en términos de nuevos modelos de negocio y cuál es su rendimiento? Esta tesis doctoral contribuye modestamente a estas preguntas de investigación a través de la explotación de bases de datos únicas y metodologías novedosas. En particular, esta tesis doctoral se ha beneficiado de amplias encuestas realizadas a principios de 2010 y proporcionadas por una de las principales empresas de distribución musical del mundo, las cuales contienen información detallada

de más de 44.000 consumidores de diez países: Australia, Canadá, Francia, Alemania, Italia, Japón, Países Bajos, España, Reino Unido y EE.UU. Además, esta información se complementa con información sobre las ventas a nivel nacional proporcionados por la Federación Internacional de la Industria Fonográfica (IFPI), y la información obtenida de fuentes secundarias tales como los índices de uso de ordenadores e Internet (IMD *Competitiveness*), y la información a nivel de empresa de bases de datos como SABI y FAME.

El presente trabajo empieza con un artículo introductorio en el que se expone un modelo *benchmark* teórico, donde se compara la situación competitiva de la industria musical antes y después de la aparición de las redes P2P, tales como Napster en 1999. Antes de la llegada de dichas redes, la alta concentración de la industria de la música hace razonable suponer que se seguían patrones monopolísticos, pero la aparición de las mismas produce una transformación hacia un modelo de duopolio en competencia de precios de productos no homogéneos, similar al modelo de duopolio de Bertrand. El modelo teórico concluye que, después de este cambio en la estructura de la competencia, la industria de la música comienza a sufrir una dramática disminución en los ingresos, los beneficios y el excedente del consumidor.

Estos análisis preliminares revelan que la industria de la música está luchando contra la piratería. Por lo tanto, el primer objetivo fue cuantificar la magnitud de la actividad de intercambio ilegal de archivos en los 10 países para los cuales se dispone de datos de encuestas. Los resultados muestran que la actividad de compartir archivos de manera ilegítima es un fenómeno heterogéneo entre países. La escala de la actividad varía desde un 14 por ciento en Alemania a un 44 por ciento en España, con un promedio muestral del 28 por ciento. Por otra parte, encontramos una correlación negativa entre las tasas de piratería de música y los gastos a nivel de país, resultado que

en cierta medida valida el efecto negativo de la piratería, descrito formalmente en la literatura como *purchase subtitution* o sustitución de compras legales por descargas ilegales. La primera conclusión, por tanto, es que es necesaria una mayor regulación en internet. Las cuestiones culturales y legales también resultan estar correlacionadas con la piratería. En particular en la primera parte de la tesis se demuestra que el origen legal de los países se correlaciona con los datos sobre la actividad de intercambio de archivos, siendo los países de origen legal alemán los que menos piratean. Otro resultado de esta primera parte es que aquellos consumidores que comparten archivos ilegales también pueden realizar compras legales. En términos agregados el 46,5 por ciento de individuos que piratean contenido musical también compra, lo que nos lleva a la pregunta de por qué la gente compra cuando tienen acceso al recurso de forma gratuita.

El segundo capítulo se basa en la teoría de los costes de transacción y la economía de los derechos de propiedad, identificando dos posibles explicaciones a la pregunta de por qué los individuos que piratean pueden realizar a su vez compras: prueban el producto en redes P2P antes de efectuar una compra legal o, alternativamente, realizan la piratería como un determinado tipo de conducta social. Nótese que este segundo efecto recoge aquellos individuos defensores de la gratuidad de los contenidos en internet, presentados en la presente tesis como *Robin Hoods*.

Los mercados digitales sufren los efectos de la piratería, la cual genera costes de transacción y una pérdida de ingresos potenciales para los propietarios de los recursos. Ahora bien, los resultados indican que el efecto exposición, o de prueba de contenidos por parte del consumidor, genera efecto aprendizaje, siendo adquiridos por los consumidores aquellos recursos percibidos como de mayor valor. Además, el efecto negativo de la piratería en los mercados digitales se atenúa parcialmente en aquellos consumidores que piratean pero tienen respeto por los derechos de propiedad intelectual.

Otra conclusión de esta segunda parte de la tesis es que los resultados indican que el mercado físico está menos influenciado por la piratería. En particular podemos rechazar la hipótesis de existencia de *purchase substitution* en el mercado físico.

Finalmente, el tercer artículo de la tesis analiza como las industrias creativas están ofreciendo un número creciente de ofertas combinadas de productos y servicios, definidas en la literatura como Sistemas de Producto-Servicio (PSS *Product Service Systems*). Mediante un método empírico novedoso se evalúa la demanda de los consumidores respecto a estos PSS a nivel de país, y se detectan los de modelo de negocio que la industria está experimentando en este sentido. Los resultados demuestran que en todos los países analizados la demanda de los consumidores relativa a formato digital fue mayor a la oferta disponible, por lo que es posible cuantificar este problema de modelo de negocio en la industria musical. Los resultados identifican las diferentes oportunidades de mercado que existen, en concreto respecto a la oportunidad de ampliar la oferta digital. Por señalar un ejemplo, EE.UU. se caracteriza por tener una oferta respecto a sistemas PSS bastante ajustada a la demanda del consumidor. Por otra parte, se presenta una correlación significativa entre el nivel del problema de modelo de negocio y el origen legal. Esta misma problemática se estudia respecto a la infraestructura tecnológica disponible. Los resultados de este artículo proporcionan importantes recomendaciones para la gestión de empresas pertenecientes a industrias creativas como la musical, cinematográfica o editorial.

# 1. GENERAL INTRODUCTION

## MUSIC INDUSTRY INSIGHTS AND RESEARCH AGENDA ON PIRACY, CONSUMER SURPLUS AND BUSINESS MODELS

**ABSTRACT**

This introductory chapter develops a theoretical benchmark model to compare the competitive situation of the music industry before and after the appearance of the P2P network Napster in 1999. Whereas the high concentration of the music industry before P2P makes it reasonable to assume that the industry follows monopolistic patterns, this monopolistic structure is transformed into a duopoly under price competition for nonhomogeneous products, presented in the prior literature as the Bertrand duopoly equilibrium. The theoretical model concludes that, after this change in the competitive structure, the music industry begins to suffer from a dramatic decrease in revenues, profits and consumer surplus. These conclusions are corroborated by a descriptive analysis, which employs different sources such as firms' accounting statements from the SABI and FAME databases, aggregate sales of the industry and consumer surveys. The article closes with the presentation of different research avenues opened by the initial benchmark model.

## 1.1. INTRODUCTION

The appearance of Napster in 1999 dramatically changed the structure of the music industry. Napster was not the first network to provide files across the Internet, but it was the first peer-to-peer (P2P) network specializing in the exchange of MP3 files with a user-friendly interface. The back-end system was built by Napster's chief architect, Jordan Mendelson. The result was a robust system whose popularity generated an enormous selection of music to download. Participants on those P2P networks were able to make their own compilation albums on recordable CDs, without paying any royalties to the artist. P2P networks such as Napster violate the intellectual property rights (IPR) of creators and distributors of music and have made the word 'piracy' accepted parlance (RIAA, 2011). The revenues of the music industry have decreased approximately 40% since the appearance of Napster (see graphic representation in Figure 2.1.1 in Chapter 1). This event and the industry's subsequent reactions have opened new opportunities for academic research. One such opportunity is the introduction of new business models (Teece, 2010), which emerge by replacing the physical product with intangible music file provision via electronic portals such as iTunes, Amazon or Spotify. Digital sources currently account for one third of music industry revenues (IFPI 2012). Parry et al. (2012) define this process as the servitization of the music industry. These business models show initial signals of success and have the potential to help the industry recover part of the accumulated revenue lost in the last 15 years (IFPI, 2013).

The main objective of this dissertation is empirically to explore piracy and business models in the music industry through the analysis of a unique dataset containing over 44,000 extensive surveys–conducted by industry experts–of music consumers residing in 10 different countries. The countries in the sample cover 4

continents and 3 legal origins as well as international commerce in creative sectors, representing 72.4% of the total exports of physical creative content in 1995 and 53.8% in 2010[1].

The following sections perform a review to analyze the current state of the music industry. Based on this analysis, we develop a simple comparative benchmark model to represent the different competitive situation before and after the irruption of Napster. Since less revenue does not necessarily mean less profit, the third section analyzes the profits of Spanish music firms in the last 20 years. This section also develops a correlation analysis between piracy activity and consumer surplus. Based on these statistics about the music industry, subsequent sections present the empirical research questions to be tackled in Chapters 1, 2 and 3 and that open paths of research beyond the scope of this thesis. These questions include evaluation of new business models and analysis of consumer utility.

## 1.2. A THEORETICAL BENCHMARK AND SIMULATION OF THE COMPETITIVE SITUATION OF THE MUSIC INDUSTRY

Casadesus-Masanell and Hervas-Drane (2010) analyze theoretically the static competitive interaction between two alternate business models for digital content distribution: Peer-to-Peer (P2P) networks, which facilitate piracy, and centralized client-server distribution led by a profit-maximizing firm. The analysis proposed here has a dynamic perspective and focuses on the evolution of market conditions due to external changes. In general terms, changes in market conditions have been explored from both economic (Kreps, 1990) and management perspectives (Porter, 1980). This study is based on the former and uses economic tools to compare the market before and after the invasion of the P2P network as a new competitor that offers a very close

[1] Source: http://tools.orkestra.deusto.es/klusterbolak/cluster/7/exports/bubble

substitute after digitalization and the appearance of Napster, two factors that changed market conditions.

Initially, we consider three different time periods in the music industry (Table 1.1). The first is the 1990s. According to Alexander (1994), the music industry was dominated during this period by six large multi-divisional and product firms (Time/Warner, Sony/CBS, Thorn/EMI, Philips-Polygram/PMG, Bertelsmann Music Group/BMG, and Matsushita/MCA), which accounted for almost all of the industry's market share. Due to this high concentration, we assume for simplicity that these large multi-divisional and product firms collude in a major licensing firm, forming a monopolistic market in which no changes in sales were observed. The second period (1999-2005) is characterized by a dramatic decrease in industry sales, which begins in 1999 (Vaccaro and Cohn, 2004) due to the introduction of disruptive innovation (Christensen and Overdorf, 2000) such as broadband and the MP3 (Tidd et al., 2005). The result of this innovation is the arrival of P2P networks as a new competitor, changing the conditions and converting the market from a monopoly to a Bertrand Oligopoly (Bertrand, 1883) until 2005. We believe that the Bertrand model is the most appropriate model for analyzing this case, in which price competition between firms captures the real market situation better than the model of competition in quantities suggested by the most frequently used Cournot model (Cournot, 1838). During this period, the profit-maximizing company must compete with the P2P network in prices with different cost structures. The third period begins in 2005, when new business models appear in the form of digital services (Parry et al., 2012). These digital services can to some extent be considered new competitors, changing again the conditions of the market by converting it into an oligopoly with more than two firms. In the next section, we design the microeconomic models for each period.

**Table 1.1. Competitive Evolution of the Market**

| | Time Period | Facts | Characterization of the Market |
|---|---|---|---|
| 1.2.1 | Up to 1999 | No changes in sales | Monopoly |
| 1.2.2 | • 1999-2005 | • Digitalization of music begins.<br>• Dramatic decrease in sales | ➢ Piracy begins, so P2P enters the market as a competitor<br>➢ Bertrand Oligopoly between music product companies and P2P |
| 1.2.3 | • 2005-present | New Business Models | ➢ Digital Services enters as a new competitor (iTunes, Amazon, Spotify, YouTube)<br>➢ Bertrand Oligopoly with more than two competitors |

### 1.2.1. MONOPOLY

Based on our main assumption of a monopolistic market due to the high concentration in the music industry until 1999, we assume a Marshallian demand function (Marshall, 1920), which specifies what the consumer would buy in each price and wealth situation, assuming that it perfectly solves the utility maximization problem. The maximization problem includes $Q$ commodities with prices $P$ and the consumer with wealth $W$, which is assumed to be constant. Hence, a set of affordable packages is defined by:

$$B(P,W) = \{Q: \langle P,Q \rangle \leq W\}$$

where $\langle P,x \rangle$ is the inner product of the prices and quantity of goods. The consumer has a utility function:

$$u = R_+^Q \rightarrow R$$

The consumer's Marshallian demand is thus defined as a function of price, and the optimal quantity is given by maximization of the utility:

$$Q^*(P,W) = argmax_{Q \in B(P,W)} u(Q)$$

assuming that there is a unique utility-maximizing package for each price and wealth situation.

The demand curve shows how many units of a product or service are consumers willing to purchase for each given price. A demand curve is only valid if all other relevant factors are held constant, or in formal terms, *ceteris paribus*. The most significant factors that can affect demand of the good are the buyers' income, its price, the prices of other goods (complements or substitutes) and the consumers' preferences. The demand in the first period for the monopolistic market is given by function (1.1):

$$Q(P) = A\text{-}B \cdot P \tag{1.1}$$

with a cost function for the major licensing firm given by function (1.2):

$$C(Q) = C \cdot Q + K \tag{1.2}$$

where $A \geq 0, B \geq 0, C \geq 0, K \geq 0$ are constants.

In this case, $Q$ is the total number of files stored in consumers' computers and $\lambda$ is the percentage of profits that the artist receives.

In Table 1.2 we solve the maximization problem for the first period.

### 1.2.2. BERTRAND OLIGOPOLY

In the second period, considered to be a Bertrand Oligopoly (Bertrand, 1883), we define the demand functions of the major licensing firm and the P2P network as functions of the price, not only of each firm's product but also of the other firm's corresponding product. In this case, the demand function for the major licensing firm changes due to the decrease in the willingness of the consumer $\left(\frac{A}{B} \geq \frac{A_1}{B_1}\right)$ to pay for a product given the existence of a much cheaper substitute provided by the new competitor, the P2P network.

**Table 1.2. Monopoly Equilibrium**

| Variables | Monopoly (1990s) |
|---|---|
| Q | $\frac{A-C}{2\cdot B}$ |
| P | $\frac{A+C}{2\cdot B}$ |
| Profit Company | $(1-\lambda)\left(\frac{(A-C)^2}{4\cdot B}-\mathrm{K}\right)$ |
| Profit Artist | $\lambda\left(\frac{(A-C)^2}{4\cdot B}-\mathrm{K}\right)$ |
| Consumer Surplus | $\frac{A^2-C^2}{8B}$ |
| Total Value | $\frac{2(A-C)^2+A^2-C^2}{8B}-K$ |

In this case, the Marshallian demand functions, for the two differentiated products specify what quantity the consumer would buy at each price for each of the products and the wealth situation, assuming this situation solves the utility maximization problem perfectly. According to the utility maximization problem, there are are $Q_1$ and $Q_2$ commodities with prices $P_1$ and $P_2$ for the products of the major licensing firm and the P2P network, respectively, and the consumer has wealth *W*. Hence, a set of affordable packages is defined by:

$$B(P_1, P_2, W) = \{Q: \langle P, Q_1, Q_2 \rangle \leq W\}$$

where $\langle P_i Q_i \rangle$ for $i = 1,2$, is the internal product of the prices and quantity of goods and $Q = Q_1 + Q_2$ are the total music files stored in consumers' computers. The consumer's Marshallian demands are defined to be functions of the prices $P_1$ and $P_2$ and the quantities given by the maximization of the utility:

$$Q_i^*(P_i P_j, W) = \text{argmax}_{Q_i \in B(P_i P_j, W)} u(Q_i) \qquad i, j = 1,2 \quad i \neq j \tag{1.3}$$

Assuming a quadratic utility function, the corresponding demands are given by the equation (1.4) similar to Vives (1985):

$$Q_i = A_i - B_i \cdot P_i + B_j^{'} \cdot P_j \qquad i, j = 1,2 \quad i \neq j \tag{1.4}$$

with the respective cost functions:

$$C(Q_i) = C_i \cdot Q_i + K_i \qquad i = 1,2 \tag{1.5}$$

where $A_i \geq 0,\ B_i \geq 0,\ B_i' \geq 0,\ C_i \geq 0,\ K_i \geq 0$ for $i = 1,2$ are constants. The assumptions for the music industry's oligopoly framework are the following:

1. The market volume of the P2P networks is greater than that of the major licensing firms. Oberholzer-Gee and Strumpf (2007) report that US households downloaded three hundred million files each month from illegal platforms, which represents approximately 95% of the total downloads (IFPI, 2009)

   $$A_2 > A_1$$

2. For simplicity, both firms have constant marginal costs, and the marginal cost for the major licensing firm is much greater than that of the P2P network, which tends to zero since a digital copy has almost zero cost:

   $$C_1 > C_2 \text{ and } K_1 > K_2 \text{ where } C_2 \to 0$$

3. We must develop assumptions regarding $B_1$ and $B_2$ or, in mathematical terms, $B_1 = \frac{\partial Q_1}{\partial P_1}$ and $B_2 = \frac{\partial Q_2}{\partial P_2}$. Notice that these coefficients are part of the price elasticity of demand, which is given by the formula $= \frac{\partial Q}{\partial P} \cdot \frac{P}{Q}$. Since we know that the demand for P2P networks is much more sensitive to price change (elastic demand) than the demand for music stores ($e_2 > e_1$), and also that the price in P2P tends to zero $\left(so\ \frac{Q_2}{P_2} > \frac{Q_1}{P_1}\right)$, it is logical to assume that $B_2$ is greater than $B_1$ :

$$\left.\begin{array}{c} e_2 = \dfrac{\partial Q_2}{\partial P_2}\dfrac{P_2}{Q_2} > e_1 = \dfrac{\partial Q_1}{\partial P_1}\dfrac{P_1}{Q_1} \\ P_2 \to 0 \; so \; \dfrac{P_2}{Q_2} < \dfrac{P_1}{Q_1} \end{array}\right\} \to B_2 > B_1$$

4. We must develop assumptions regarding $B_1'$ and $B_2'$ or, in mathematical terms, $B_1' = \frac{\partial Q_2}{\partial P_1}$ and $B_2' = \frac{\partial Q_1}{\partial P_2}$. Notice that these coefficients are part of the cross-price elasticity of demand, which is given by the formula $e_{x,y} = \frac{\partial \mathrm{Q_x}}{\partial \mathrm{P_y}}\frac{\mathrm{P_y}}{\mathrm{Q_x}}$. Since we know that the price for P2P tends to zero $\left(so \; \frac{Q_1}{P_2} > \frac{Q_2}{P_1}\right)$, it is logical to assume that $B_2'$ is greater than $B_1'$ :

$$\left.\begin{array}{c} e_{2,1} = \dfrac{\partial Q_2}{\partial P_1}\dfrac{P_1}{Q_2} \to B_1' = e_{2,1} \cdot \dfrac{Q_2}{P_1} \\ e_{1,2} = \dfrac{\partial Q_1}{\partial P_2}\dfrac{P_2}{Q_1} \to B_2' = e_{1,2} \cdot \dfrac{Q_1}{P_2} \\ P_2 \to 0 \; so \; \dfrac{Q_1}{P_2} > \dfrac{Q_2}{P_1} \end{array}\right\} \to B_2' > B_1'$$

5. Willingness to pay for the product of the major licensing firm decreases with the introduction of the P2P network. During the second period, willingness to pay is lower for the P2P network's product than for the product of the major licensing firm:

$$\frac{A}{B} \geq \frac{A_1}{B_1} \geq \frac{A_2}{B_2}$$

6. The maximum price that a consumer is willing to pay for an illegal music file is small $(\varepsilon)$ due to the psychological cost.[2] For simplicity, we assume that $\varepsilon = 1$.

[2] The price that a file sharer pays for an illegally downloaded music file is zero. These individuals incur in a psychological cost (Hennig-Thurau et al., 2007), however, and this download generates revenues for the P2P network in the form of publicity: (http://www.guardian.co.uk/media/2013/feb/05/pirate-sites-advertising-illegal-music-downloads?CMP=twt_gu) last accessed February 6, 2013.

$$\frac{A_2}{B_2} \leq \varepsilon$$

7. In the moral hazard problem between firms and creators of the content, artists receive an incentive in the form of royalties (Jensen and Thursby, 2001). Royalties are defined by $\lambda_j$ for $i = 1,2$ from the major licensing firm and the P2P network, respectively. We assume that the major licensing firm pays positive royalties($\lambda_1 > 0$), whereas the P2P network does not pay any ($\lambda_2 = 0$).

$$\lambda_1 > \lambda_2 = 0$$

We can now solve the maximization problem for the second period, where the reaction functions for the Bertrand equilibrium are given by the equations:

$$P_i(P_j) = \frac{A_i + B_j' \cdot P_j - C_i \cdot B_i}{2 \cdot B_i} \qquad i, j = 1,2 \quad i \neq j \tag{1.6}$$

### 1.2.3. NUMERICAL SIMULATION

Due to the complexity of the theoretical solution for drawing clear conclusions, we solve a numerical example under the assumptions mentioned for the two periods.

*Monopolistic market:* Assuming that $Q$ is the total number in millions of files stored in consumer computers and $P$ is the price, the demand function is given by $Q = 70 - 2 \cdot P$, with a cost function: $C(Q) = 5 \cdot Q$.

*Oligopolistic market (Bertrand Oligopoly):* For the oligopolistic market, the total number of files stored in consumers' computers is Q= $Q_1 + Q_2$ , where $Q_1$ are the files purchased legally from the major licensing firm and $Q_2$ the files downloaded illegally from the P2P network.

The corresponding demands for the major licensing firm and the P2P network are therefore $Q_1 = 30 - 2 \cdot P_1 + 2 \cdot P_2$ and $Q_2 = 200 - 200 \cdot P_2 + P_1$, with the respective cost functions $C(Q_1) = 5 \cdot Q_1$ and $C(Q_2) = 0$.

The values of the parameters are shown in Table 1.3 and the results of the numerical example in Table 1.4.

**Table 1.3. Parameters of the Numerical Simulation**

| **Competitive situation** | **Theoretical parameter** | **Parameter value in simulation** |
|---|---|---|
| Monopolistic major licensing firm | A | 70 |
| | B | 2 |
| | C | 5 |
| | K | 0 |
| Oligopolistic major licensing firm | $A_1$ | 30 |
| | $B_1$ | 2 |
| | $B_1'$ | 1 |
| | $C_1$ | 5 |
| | $K_1$ | 0 |
| | $\lambda_1$ | λ |
| Oligopolistic P2P competitor | $A_2$ | 200 |
| | $B_2$ | 200 |
| | $B_2'$ | 2 |
| | $C_2$ | 0 |
| | $K_2$ | 0 |
| | $\lambda_2$ | 0 |

**Table 1.4. Results of the Numerical Simulation**

| | **Monopoly (1990s)** | **Bertrand (current situation)** |
|---|---|---|
| Q | 30 | ---- |
| Q1 | ---- | 10.52 |
| Q2 | ---- | 106.25 |
| P | 20 | ---- |
| P1 | ---- | 10.26 |
| P2 | ---- | 0.52 |
| Revenues Company | 600 | 107.93 |
| Profit Company | $(1-\lambda)\cdot 450$ | $(1-\lambda)\cdot 55.33$ |
| Profit Artist | $\lambda\cdot 450$ | $\lambda\cdot 55.33$ |
| Revenue P2P | ---- | 55.25 |
| Profit P2P | ---- | 55.25 |
| Consumer surplus | 225 | $24.93+25.44=50.37$ |
| Total Value | 675 | 130.95 |

We derive the following conclusions from the numerical example:

- Positive profits are obtained for both the licensing firm and the P2P network, confirming Clarke and Collie (2003), the usual solution in Bertrand models for heterogeneous goods.
- The revenues of the major licensing firm fall by 82%, and the profits of the major licensing firms fall by 87%. The profits obtained by the creators and the firm thus decrease by 87%. This reduction of profits diminishes the incentives of the artist, intensifying the moral hazard problem and justifying the call for regulation.

- In contrast to the argument that P2P networks increase utility for consumers (Rogers et al., 2010), we find that consumer surplus falls by 77%, due to a reduction in willingness to pay. This finding represents an advance over previous theoretical models (Bertrand, 1883; Vives, 1985), which assume constant willingness to pay. The dramatic fall in consumer surplus provides another important reason for regulation.
- The total value falls by 80%, and the only party increasing its gains is the P2P network, which does not compensate for the reduction in overall welfare. More competition does not generate value, inviting the implementation of new market and property rights regulations.

### 1.2.4. New Business Models or Bertrand Oligopoly with n differentiated Competitors

A more general and sophisticated model for characterizing the market structure of the music industry must take into account the new business models, such as streaming services (iTunes, YouTube), that emerge to compete in price with the existing models (such as product sales or P2P platforms) given the presence of differentiated products.

For the market during the third period defined above, we assume *n* competitors, with corresponding prices $P_1, P_2, \ldots\ldots P_n$ for each differentiated product from each competitor and the following demands:

$$Q_i = A_i - B_i \cdot P_i + \sum_{j=1}^{n} B_j' \cdot P_j \qquad i, j = 1,2, \ldots . n \quad i \neq j \qquad (1.7)$$

This problem is quite complicated to solve theoretically, due to the complex relationships between competitors, who cooperate in some cases. We do not, therefore, have enough information to design the demand functions for each competitor. This is an avenue for future theoretical research on music industry structure.

## 1.3. EMPIRICAL INSIGHTS OF THE WELFARE OF THE MUSIC INDUSTRY

### 1.3.1. PROFITS AND REVENUES

The revenues of the major licensing firm $\left(Q(P^*) \cdot P^*\right)$ in our theoretical simulation decreased by 82%. This is not far from the decrease found in Figure 2.1 of Chapter 2, where for the case of Spain we find a 70% decrease in revenues (603 million in 2000 to 186 million in 2010). Does the same occur with profits $\left(Q\left(P^*\right) \cdot P^*\text{-}C\left(Q\left(P^*\right)\right)\right)$?

Because profits must be analyzed at firm, not industry, level, we extracted financial information from the FAME database for global and European music multinationals and the SABI database for Spanish music multinationals and local music Small and Medium Enterprises SMEs.

According to Florida and Jackson (2010), music industry firms are becoming more concentrated in big cities. We collected information on music firms located in large urban areas in Britain and Spain (London, Madrid and Barcelona), as we expected to find the most competitive firms in these locations. Moreover, following Hracs (2013), there are 2 types of music firm: multinationals (EMI, UNIVERSAL, SONY) and local firms. For the major multinational music firms mentioned above, we have data for the case of the conglomerate performance and for its Spanish business. For the local music firms, we chose a random group of 6 local Spanish music SMEs, all of which are categorized in the CNAE2009 under code 5920. These firms provide different recording, music editing and promotion services for local artists. To avoid survival bias, we consider only firms that were active in 2011.

How to measure a firm's profit has led to a long debate in the literature (Cooper et al., (1994), Storey (1994), Wiklund et al. (2003)). At a theoretical level, the current value of all economic profits obtained over a firm's life is the optimal evaluation of

venture performance. This measure is difficult to obtain, however. For example, the firm's opportunity cost is unobservable and heterogeneous. According to Robinson (1999), the Return on Assets (ROA) is an appropriate measure for assessing firms' financial performance because it "indicates management's effectiveness in employing the assets entrusted to them and does not depend on the alternative uses of debt versus equity to fund such assets" (p. 169). Without taking relevance from other measures (i.e., ROE, ROI, ROS), we use ROA as a comprehensive criterion, as suggested by Robinson, to compute the profits of local and multinational music firms.

Figures 1.1 and 1.2 report the evolution of the ROA for global and Spanish business of multinational firms, respectively. In the case of the Spanish business of multinational firms, all firms report their maximum profits before 2001. EMI SPAIN reported its maximum profits in 2001 as 29.8%, UNIVERSAL SPAIN in 1998 as 14.2%, and SONY SPAIN in 1998 as 28.3%. In 2011, these firms' performance is significantly smaller—3 times smaller for EMI SPAIN, 6 times smaller for SONY SPAIN, and negative for UNIVERSAL SPAIN. If we examine the same firms at the international level for the time period 2003 and 2012, EMI GLOBAL reports maximum profits in 2003 and SONY EUROPE and UNIVERSAL GLOBAL in 2004. As in the case of the Spanish business of multinational firms, the performance of these firms falls significantly, reaching minimum levels in 2011 for EMI GLOBAL, 2012 for SONY EUROPE and 2009 for Universal GLOBAL. These results confirm the general tendency of a significant decrease in profits.

**Figure 1.1. Return on Assets Evolution of the Global Business of Multinational Music Firms**

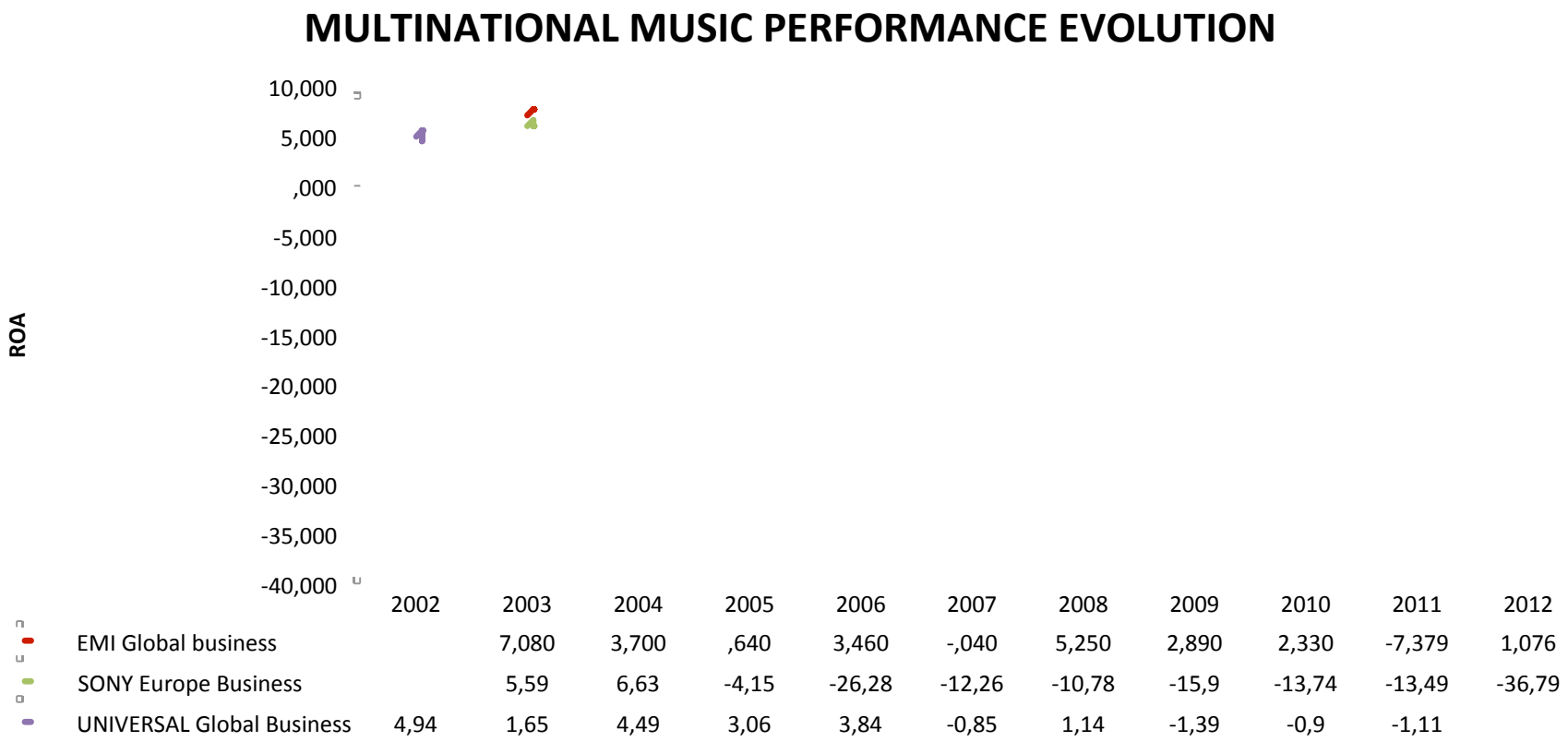
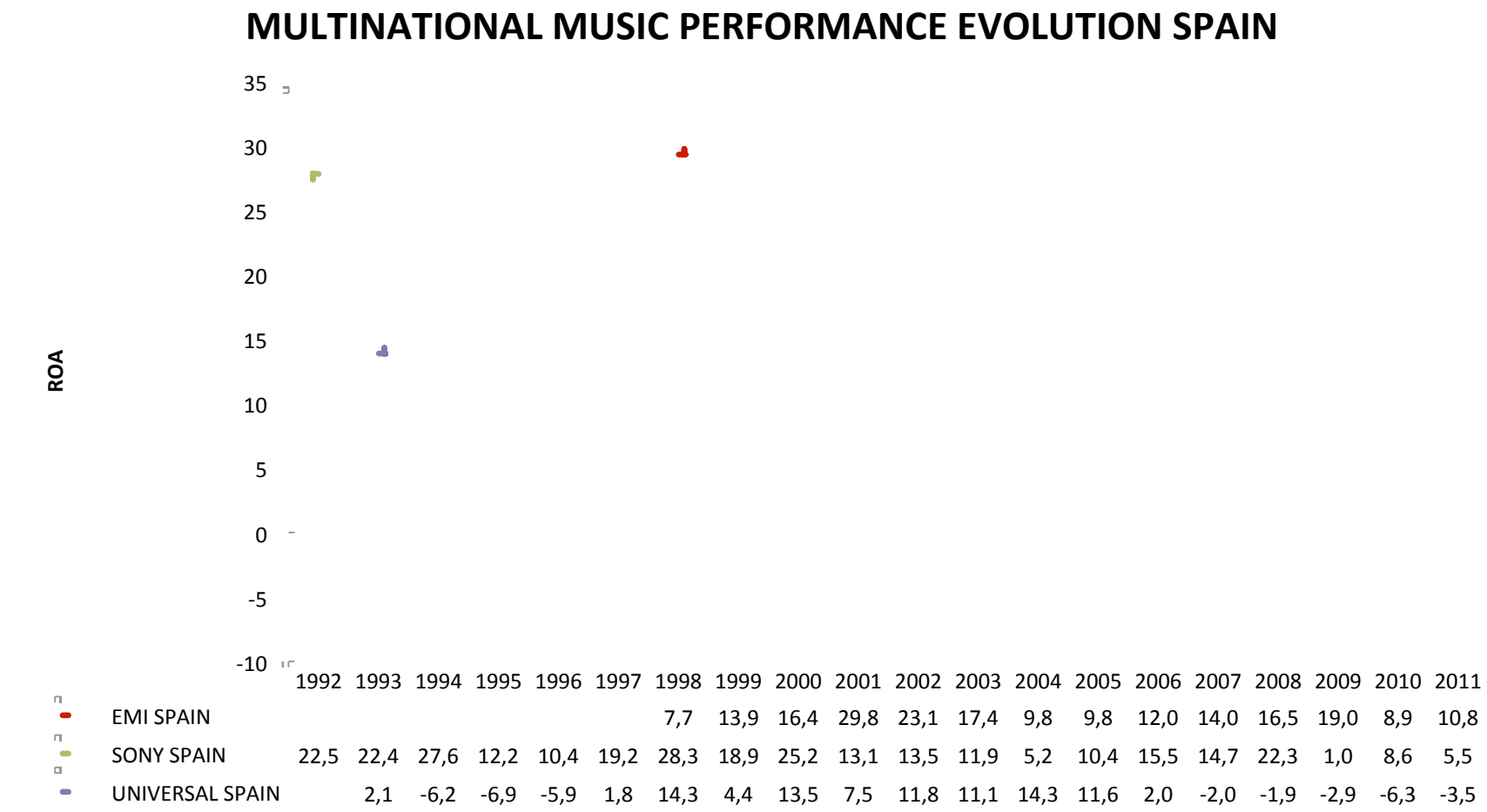
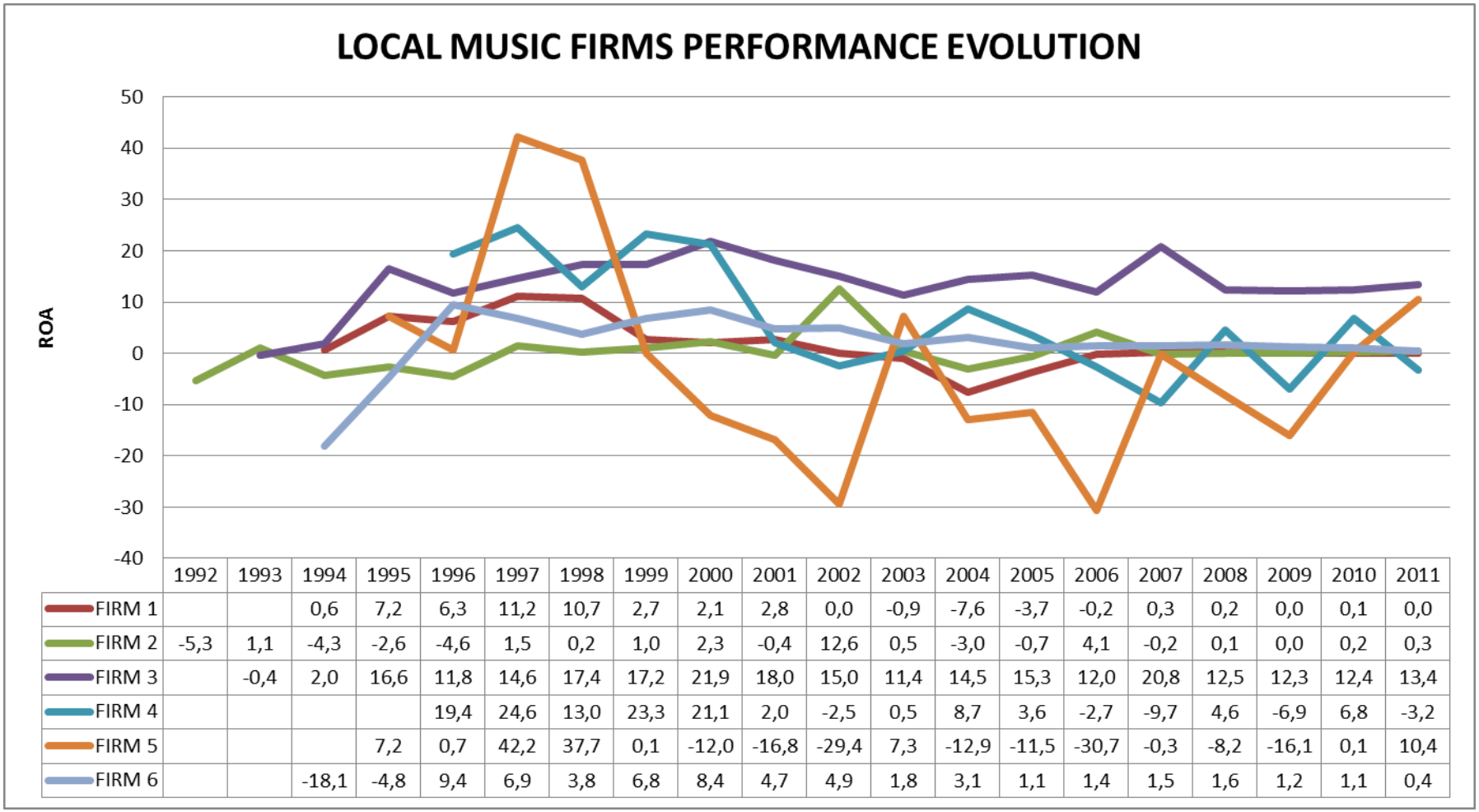


**Figure 1.2. Return on Assets Evolution of the Multinational Music Firms Operating in Spain**




| | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EMI SPAIN | | | | | | | 7,7 | 13,9 | 16,4 | 29,8 | 23,1 | 17,4 | 9,8 | 9,8 | 12,0 | 14,0 | 16,5 | 19,0 | 8,9 | 10,8 |
| SONY SPAIN | 22,5 | 22,4 | 27,6 | 12,2 | 10,4 | 19,2 | 28,3 | 18,9 | 25,2 | 13,1 | 13,5 | 11,9 | 5,2 | 10,4 | 15,5 | 14,7 | 22,3 | 1,0 | 8,6 | 5,5 |
| UNIVERSAL SPAIN | | 2,1 | -6,2 | -6,9 | -5,9 | 1,8 | 14,3 | 4,4 | 13,5 | 7,5 | 11,8 | 11,1 | 14,3 | 11,6 | 2,0 | -2,0 | -1,9 | -2,9 | -6,3 | -3,5 |

**Figure 1.3. Return on Assets Evolution for Spanish Local Music Firms**




| | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FIRM 1 | | | 0,6 | 7,2 | 6,3 | 11,2 | 10,7 | 2,7 | 2,1 | 2,8 | 0,0 | -0,9 | -7,6 | -3,7 | -0,2 | 0,3 | 0,2 | 0,0 | 0,1 | 0,0 |
| FIRM 2 | -5,3 | 1,1 | -4,3 | -2,6 | -4,6 | 1,5 | 0,2 | 1,0 | 2,3 | -0,4 | 12,6 | 0,5 | -3,0 | -0,7 | 4,1 | -0,2 | 0,1 | 0,0 | 0,2 | 0,3 |
| FIRM 3 | | -0,4 | 2,0 | 16,6 | 11,8 | 14,6 | 17,4 | 17,2 | 21,9 | 18,0 | 15,0 | 11,4 | 14,5 | 15,3 | 12,0 | 20,8 | 12,5 | 12,3 | 12,4 | 13,4 |
| FIRM 4 | | | | | 19,4 | 24,6 | 13,0 | 23,3 | 21,1 | 2,0 | -2,5 | 0,5 | 8,7 | 3,6 | -2,7 | -9,7 | 4,6 | -6,9 | 6,8 | -3,2 |
| FIRM 5 | | | | 7,2 | 0,7 | 42,2 | 37,7 | 0,1 | -12,0 | -16,8 | -29,4 | 7,3 | -12,9 | -11,5 | -30,7 | -0,3 | -8,2 | -16,1 | 0,1 | 10,4 |
| FIRM 6 | | | -18,1 | -4,8 | 9,4 | 6,9 | 3,8 | 6,8 | 8,4 | 4,7 | 4,9 | 1,8 | 3,1 | 1,1 | 1,4 | 1,5 | 1,6 | 1,2 | 1,1 | 0,4 |

Figure 1.3 reports the evolution of ROA for local Spanish music firms. Only Firm 3 achieves relevant profits (10% and above) consistently during the period analyzed. The other firms do not achieve sustained profits. Most reach the maximum ROA between 1998 and 2002. For instance, Firm 5 reached a 42% ROA in 1997 and a 37% ROA in 1998. From this moment on, this firm achieves marginal or negative profits, the only exception being 2011, when it reaches a 10.4% ROA. The other firms are currently achieving marginal profits. This result is consistent with our theoretical simulation, but it is not consistent with the work of Hracs (2013), which expects local firms to adapt better than multinational firms.

### 1.3.2. CONSUMER SURPLUS

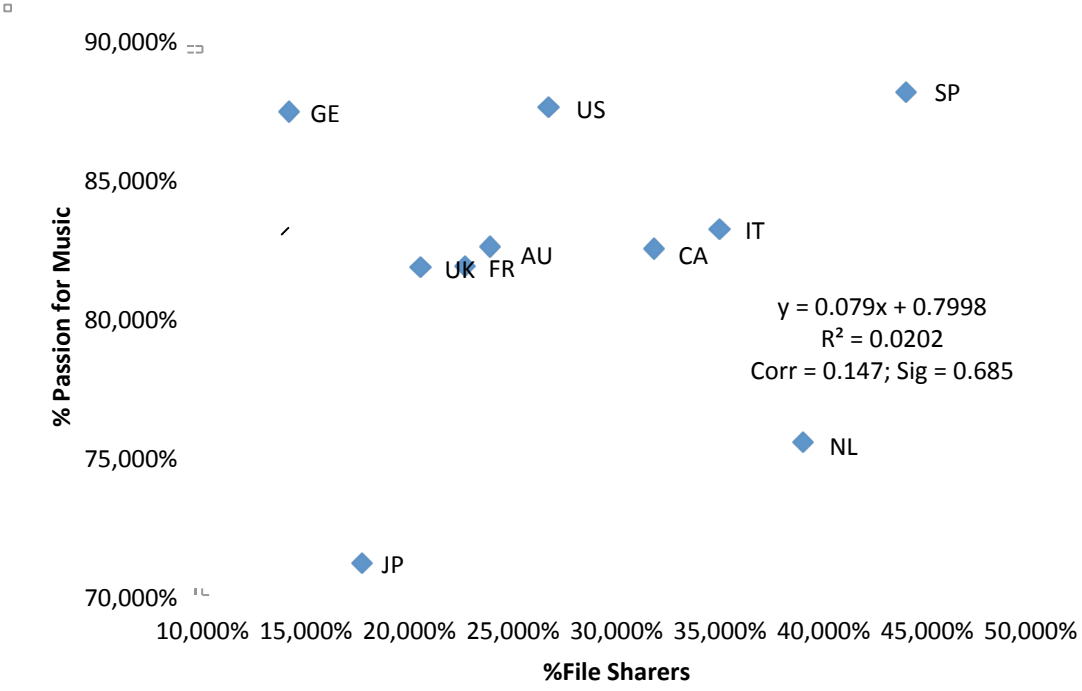
According to Greenstein and McDevitt (2011, p. 631), "no careful method exists for calculating the consumer surplus for an unprized good with widespread user contributions". Since we do not have access to an appropriate measure of consumer surplus for P2P networks, we use passion for music, which is available in our database and presented in Chapter 3. Passion for music has been used in recent research (Dang Nguyen et al., 2012) and represents the consumer's satisfaction with the music content offering. To a certain extent, it can thus be considered an appropriate proxy of consumer surplus.

One of the implications of our theoretical model is that average consumer surplus falls after the appearance of P2P networks. Ideally, this theoretical result should be explored empirically in a longitudinal setting by examining the decrease in consumer surplus over time for a given market. Unfortunately, our data cover only one period, 2010. One alternative is to perform a correlation analysis of passion for music and average file sharing activity (see last column of Table 2.1) at national level. This method permits us to extract only limited conclusions, however, since we cannot

control for country-specific effects such as consumer culture (Lenartowicz and Roth, 1999) or marketing perception (Gaski and Etzel, 1986).

Figures 1.4 and 1.5 represent this correlation graphically. The x-axis shows information on the file sharing activity at national level and the y-axis information on passion for music. Passion for music in 2010 ranged from slightly over 70% in Japan to almost 90% of the national population in Spain, Germany and the US. Music is thus an important part of the life for most consumers (IFPI, 2013).

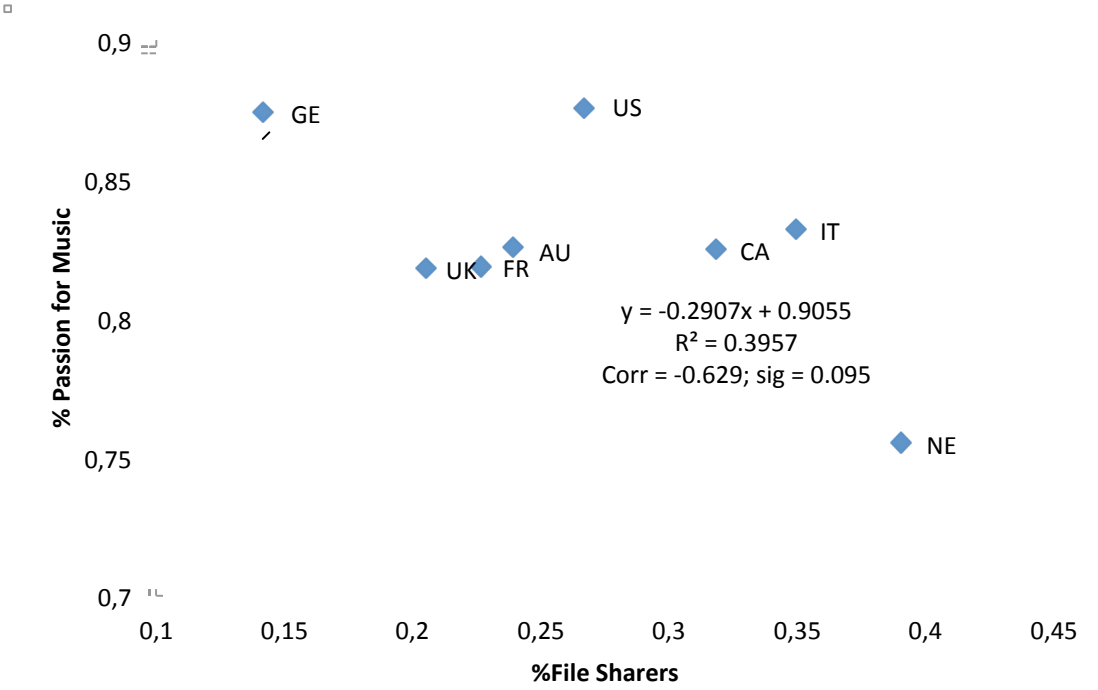
**Figure 1.4. Passion for Music and Piracy for Full Sample**




According to Figure 1.4, there is no linear correlation between the variables partially corroborating the intuition of our findings in the theoretical model. The presence of people who share files in a country does not imply more passion for music, or more consumer surplus. One way to control for the bias caused by country-specific patterns is to analyze outliers (Barnett and Lewis, 1984). According our data, we consider that Spain and Japan could be treated as outliers. Spain has the maximum piracy and the maximum passion for music, while the passion for music in Japan is

clearly lower than in the other countries analyzed. In Figure 1.5, we perform the correlation analysis without taking into account the two outliers indicated above. The results now are fully consistent with our theoretical prediction, showing a negative linear correlation between passion for music and file sharing activity. This correlation has a coefficient of -0.629 and is statistically significant at 10%.

**Figure 1.5. Passion for Music and Piracy without Outliers, Spain and Japan**




The fact that consumer surplus seems to correlate negatively with the appearance of P2P networks is a relevant result, as it contradicts the extended perception that P2P networks increase consumer value (Rogers et al., 2010).

## 1.4. STREAM OF RESEARCH

### 1.4.1. OBJECTIVES OF THE THESIS

### 1.4.2. CHAPTER 2: MUSIC BUSINESS MODELS AND PIRACY

The central objective of the thesis is to understand the two main problems of the music industry: the piracy problem and the business model problem. To measure these two problems in the first chapter, we use a unique database of consumer insight data

and assume that each consumer buys just one unit of the product. We can then obtain the percentage of the population that is interested in buying music legally $S_1 = \frac{A_1}{T}$ , where $A_1$ is the maximum number of people who buy one unit legally and $T$ is the total population. The percentage of the population interested in illegal downloads instead of buying is $S_2 = \frac{A_2}{T}$ , where $A_2$ is the maximum number of people who download one unit illegally. According to our estimations, since $S_1 + S_2 < 1$ , there is a percentage of the population that is out of the market represented by $1 - (S_1 + S_2)$ , confirming the existence of the business model problem.After analyzing our data at national level, we find heterogeneity not only of the piracy problem $(S_2)$ but also of the business model problem $(S_1)$ across countries.

Another objective of the second chapter is to determine how the two problems mentioned above correlate with sales in the music industry. The results obtained show a negative and significant correlation with sales in both cases (see Figure 2.4 and Figure 2.8).

### 1.4.3. CHAPTER 3: TOWARDS AND UNDERSTANDING OF TRANSACTION COSTS AND CONSUMER BEHAVIOR: WHY DO THOSE WHO SHARE FILES ALSO PURCHASES

The third chapter of the thesis is motivated by one of the findings in Chapter 2. The fact that 46.5% of the file sharers also buy music contradicts the purchase substitution effect, where consumers substitute legal purchases for illegal downloads (Liebowitz, 2006), a phenomenon verified in many empirical works, such as Liebowitz (2008). Assuming that $Q_1$ and $Q_2$ are the decisions to purchase and to share files, respectively, the result found in Chapter 1 implies that the probability of a regular file sharer buying legally is equal to 0.465 $(P(Q_1/Q_2) = 0.465)$. According to purchase substitution, this probability should be zero. The main objective in Chapter 2 is to

explain why this happens. A possible explanation could be that other factors affect the probability of purchase $P(Q_1)$. Following transaction cost theory, we introduce two other possible factors to explain the probability of purchase —sample exposure and respect for property rights. Sample exposure is defined as the access to resources that enables consumers to evaluate them before making an informed purchasing decision (Liebowitz, 2006). Following this definition, we assume that the probability of purchase depends on three factors: purchase substitution($Q_2$), sample exposure ($h$), and respect for property rights ($b$). Therefore, the probability of purchase for the individual $i$ is given by:

$$P(Q_{1i}) = f(Q_{2i}, h_i, b_i)$$

The main results of Chapter 3 verify the existence of purchase substitution in the case of the digital market. They also confirm sample exposure and respect for property rights as two possible explanations why illegal file sharers also make purchases.

### 1.4.4. CHAPTER 3: THE LINKAGE BETWEEN PRODUCT-SERVICE PORTFOLIO AND CUSTOMER VALUE

In this chapter, we focus on the second main problem of the music industry, the business model problem. In Chapter 2, we found that 22% of the total population does not buy music either legally neither illegally. The main question raised here is thus why this group of the population is not interested in music.

We can analyze the problem by comparing the existing supply with an estimation of the demand through a new empirical method in order to identify the equilibrium and its characteristics. The evolution of the market under these new conditions, such as the introduction of new competitors and new products or services, raises the risk of not capturing the consumer's attention properly or not satisfying his/her utility, perhaps

because the consumer is not prepared to understand the values of the new product-service systems (Neely, 2008) of the music industry. Assuming the simple case of two differentiated products in digital and physical format, we can estimate the expected utilities $E(U_{Digital})$ for the digital and $E(U_{Physical})$ for the physical product.

The next step is to estimate the supply function for these two products using market data, where the supply function for digital format will be:

$$S = \frac{P_{Digital} \cdot Q_{Digital}}{P_{Digital} \cdot Q_{Digital} + P_{Physical} \cdot Q_{Physical}} = \%\ of\ Digital\ Sales$$

The objective here is to evaluate the match between the supply and demand functions. The average utility is compared graphically to the sales bundling of product or services. The evidence provided reflects a lack of digital offerings globally, being this problem less acute in countries with English legal origin, especially in US (Figure 4.6).

## 1.5. FUTURE RESEARCH

### 1.5.1. EVALUATION OF NEW BUSINESS MODELS

The Business Model refers to the design of the value creation, delivery and capture mechanisms employed by an enterprise to entice customers to pay for value and to convert those payments to profit (Teece, 2010). This dissertation identifies a business model problem in the music industry, but it does not evaluate the economic impact of new business models.

Many new music business models reflect a theoretical shift in understanding what music retail is, presenting music to consumers not as a product but as a service (Parry et al., 2012). Examples include pay-as-you-go business models exemplified by Apple's iTunes and pay-monthly models exemplified by streaming subscription services such as Spotify (Osterwalder and Pigneur, 2010). Streaming subscription services have been

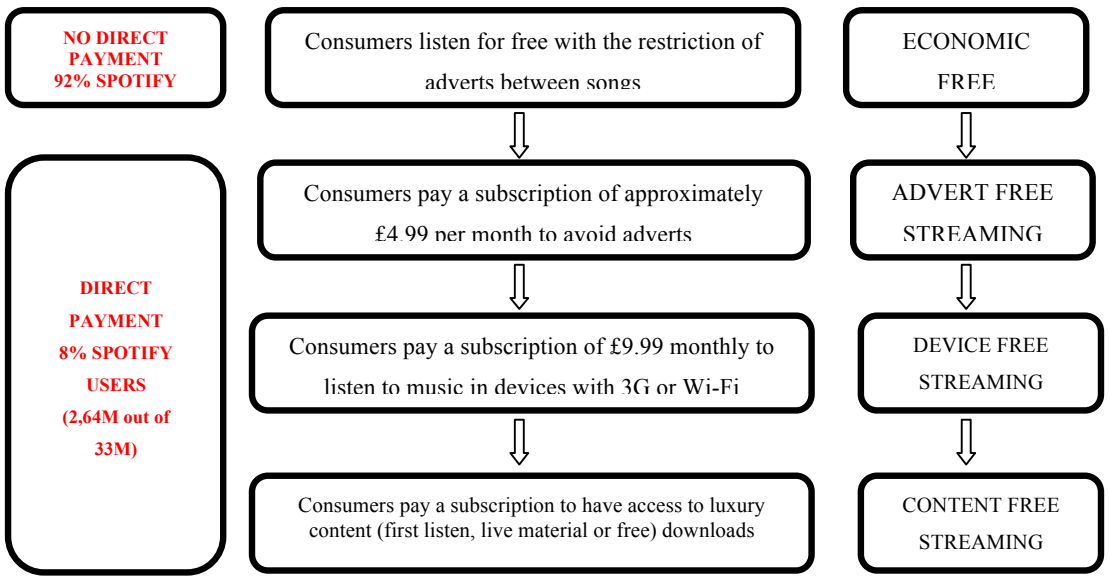
based on a freemium business model (Teece, 2010), in which consumers have the possibility of subscribing free with some constraints, usually the introduction of advertising between songs or the restriction of some content. These business models have the advantage of separating the resource attribute of consumption from the attributes of copying, storing and distribution that stimulate illegal file sharing. A first research question is to what extent advertising-based streaming subscriptions can transform the behaviour of file sharers into a legitimate one. Indeed, recent industry research relates the use of these business models to a surge in revenues (IFPI, 2013).

According to Spotify data, 92% of streaming subscribers use the service's free version based on adverts. As can be seen in Figure 1.6, other consumers pay different quotas depending on the services contracted. These services range from avoiding adverts to full availability of content. Some research questions arise from this information. They include the question of which variables influence the conversion from file sharing or not purchasing to free streaming subscription and which variables persuade consumers to subscribe to a service with a positive price. Unfortunately, the database employed in this dissertation did not provide access to streaming data. Our future research will continue to pursue these questions.

Subscription solutions seem fully compatible with the business model consisting of the exploitation of the sales channel to enhance tangible attributes. For example, consumers showing 'band fan' characteristics that aim to demonstrate a close identification with a group may purchase luxury box sets and band-related merchandise (Parry et al., 2012). The literature considers these materials positional goods (Frank, 1985). A stream of empirical research in marketing and consumer psychology analyzes consumers' preferences and their willingness to pay for positional goods (see Ariely and Norton (2009) for a review). A recent example is the study performed by

Almengberg and Dreber (2011) on wine consumption. Wine is an ambiguous product, and researchers sought to determine whether consumers give different value to a bottle when they know the price. The experiment was performed in 2008 in US with 266 individuals. 50% of the sample tasted and rated a red wine. The consumers were given price information before rating (treatment group) and others were not (control group). The authors concluded that the price information was used for overrating the value of the expensive wine. Regardless of the quality of the product, respondents seem to give value to attributes denoting status or position. Further research, beyond the scope of this dissertation, should analyze the economic effect of implementing a business model based on positional goods in the music industry, preferably through field experiments, since these can control and isolate the causal effect of interest (Falk and Heckman, 2009). Such experiments should attempt to answer the following questions, among others: (1) Do consumers place premium value on a digital track contained in a luxury box set? (2) What is this premium value in economic terms?

**Figure 1.6. Streaming Subscription Structure**




Source http://www.guardian.co.uk/money/2013/feb/02/music-streaming-spotify-deezer-rdio

### 1.5.2. A BETTER UNDERSTANDING OF THE CONSUMER'S ATTITUDES

This dissertation treats consumer utility and demand functions as a static phenomenon, even though they follow dynamic patterns (Greenstein and McDevitt, 2011) and must be explored through longitudinal methodologies. This implies that future research that seeks to shed light on constructs such as consumer willingness to pay or consumer surplus must analyze data at different moments of time. One possibility would be to conduct extensive surveys, such as the one used here, for different years to see the evolution of passion for music and file sharing activity over time.

As offerings become more complex, companies need proactive consumer involvement (Prahalad and Ramaswamy, 2000). Dialogue with their customers is a phenomenon called value co-production (Normann and Ramírez, 1993). Parry et al. (2012) generate a construct to analyze the attitude of music consumers towards value co-production and conclude that 60% of the population may engage in those activities. Future research might analyze in depth the nature of value co-production in creative industries. An appropriate arena for this research is the social networks (Kosinsky et al., 2013), such as Facebook. For example, future analysis could relate social network activity to purchasing activity. This will allow us to disentangle the economic impact of social networks, in other words, the conditional probability of purchasing music when the consumer has pushed the button "like" on the artist's page.

# CHAPTER 2

# 2. BUSINESS MODELS AND PIRACY IN THE MUSIC INDUSTRY

**ABSTRACT**

The purpose of this chapter is to estimate the scale of illegal file sharing activity across 10 countries and examine the correlation of this activity with country revenues. The work elucidates an underexplored business model challenge which exists in parallel with a music piracy challenge. Results show that non-legitimate file sharing activity is a heterogeneous issue across countries. The scale of activity varies from 14 per cent in Germany to 44 per cent in Spain, with an average of 28 per cent. File-sharing activity negatively correlates to music industry revenue per capita. This research finds many consumers are not engaging with online business models. Almost one fourth of the population claim that they do not consume digital music in either legal or illegal forms. This phenomenon is also negatively correlated with sales per capita. Regarding the implications of this comparative work I focus upon business models which sell music as tracks or albums. The work identifies that a countries' legal origin correlates to data on file sharing activity, with countries from a German legal origin illegally file sharing least. The practical implications of the results support the need for policy makers to introduce strong Intellectual Property Rights (IPR) regulation which reduces file-sharing activity. The work also identifies a large percentage of non-participants in the digital market who may be re-engaged with music through business model innovation. The challenge of engaging consumers in the digital market through different business models is discussed in light of digital music's high velocity environment.

## 2.1. INTRODUCTION

Revenues in the global music industry have been shrinking since the start of the twenty first century (Liebowitz and Watt, 2006; Liebowitz, 2006, 2008; Elberse, 2010; IFPI, 2011). Firms in this sector are moving from a focus on selling music as a physical product towards creating value from selling music in digital formats (Parry *et al.*, 2012) which gives rise to different business models (Balocco *et al.*, 2010). A clear correlation exists between digitalization (i.e. MP3 format, broadband availability, online file sharing) and revenue decline in the music industry, with the most common explanation for this decline being the role of illegal file sharing, often referred to as piracy (Liebowitz, 2008). One form of the piracy phenomena has been identified as purchase substitution, where music consumers substitute legal purchases for illegal downloads (Liebowitz and Watt, 2006; Liebowitz, 2006). Widespread availability of broadband internet facilitates the growth of file sharing. As physical distance is largely irrelevant for internet based file sharing, individuals from across the world can participate (Siwek, 2007; RIAA, 2011). To counter act illegal file sharing some countries have introduced stronger legislation protecting Intellectual Property Rights (IPR). Different papers show a correlation between stronger legislation protecting IPR and increases in revenues (Bhattacharjee *et al.*, 2006; Adermon and Liang, 2010; IFPI, 2011; Danaher *et al.*, 2012).

However, preventing piracy may not be the sole solution necessary to help the industry to recover. The fall in revenue is partially attributed to a reduction in consumption as a result of the consumer's unfamiliarity with new digital sales formats, as time is needed to learn and adapt to new digital technologies (Parry *et al.*, 2012). In this new product-service system, in which market information is scarce, customers play a central role in creating value (Hilletofth, 2011) and to be successful firms need to

adopt a customer-oriented perspective (Öztaysi *et al.*, 2011). In that direction and analyzing the music market, there are two groups of consumers that need to be recovered in order to increase revenues: (1) file sharers and (2) consumers not happy with the commercialization channel or business model.

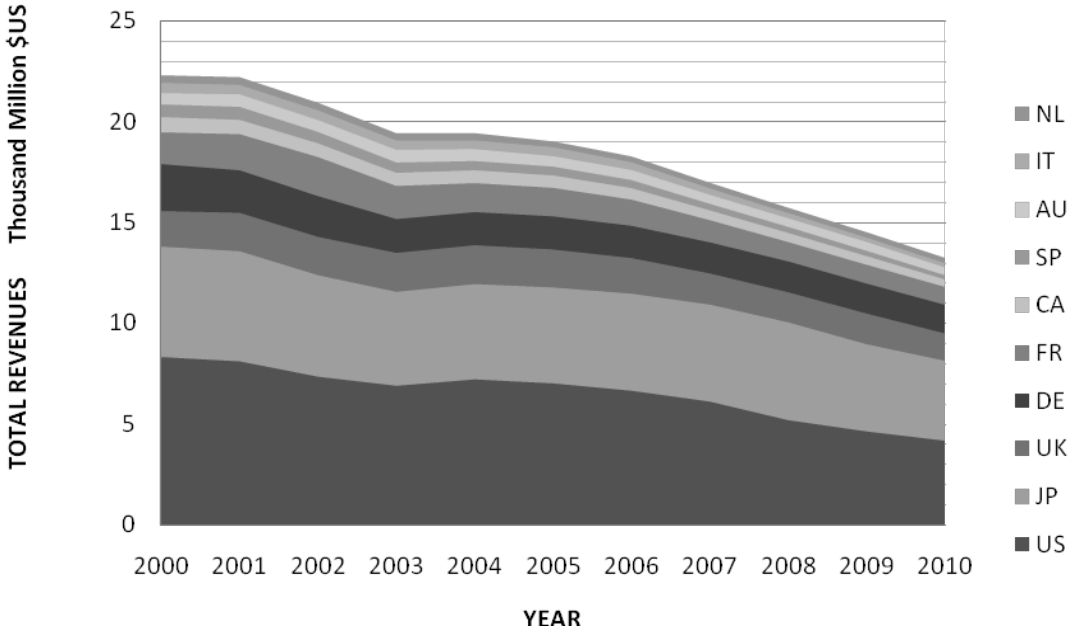
This study analyzes how determinant can be to properly manage the new music business models to recover music revenues and how part of the problem is due to piracy indicating some managerial issues to be addressed. It uses a rich and unique dataset from more than 44,000 surveys conducted in 2011 in 10 different countries. The objective of the study is twofold. In a first step to estimate file sharing and business model problems for the 10 countries with data available. Second to show the correlation between file sharing and business model with the total revenues per capita at country level.

The order of the study is as follows. Next section explains the data available in detail and the results. Section 3 concludes with a discussion of the results found in this empirical study.

## 2.2. DIGITAL BUSINESS MODELS AND PIRACY

Revenues in the music industry have decreased substantially in the beginning of the twentieth one century (see Figure 2.1). The total sales from the 10 countries analyzed decreased from US$22bn in 2000 to US$13bn in 2010. From the literature two scenarios are identified which may be contributing towards the decrease in revenue: illegal file sharing of digital music and business models which are unfamiliar to the consumer. This study attempts to quantify and disentangle the two scenarios and identify which may be the most significant in different contexts.

**Figure 2.1. Evolution of Music Sales per Country**




### 2.2.1. THE FILE SHARING CHALLENGE

According to Liebowitz (2008) Internet penetration and broadband decreased music revenues in the US in the period 1998-2003. In economic terms file sharing reduces music sales when the market price of songs are higher than its consumer utility (Waldfogel, 2010). In this sense, piracy is a form of purchase substitution (Liebowitz and Watt, 2006; Liebowitz, 2006), where music consumers substitute illegal downloads for legal purchases. Empirical evidence supports the premise that illegal file sharing reduces music industry revenue, which supports calls for greater IPR protection (Hong, 2004; Rob and Waldfogel, 2004; Liebowitz, 2008; Michel, 2006; Zentner, 2006; IFPI, 2011). IPR protection takes two forms, either technological constraint on the user, e.g. Digital Rights Management [DRM], or the introduction of legislative instruments.

Vernik *et al.* (2011) show that DRM is ineffective in preventing piracy as those who suffer most inconvenience from usage restrictions are legal purchasers. On the contrary, empirical studies of legislative reforms in different countries suggest that this is an effective approach (Battacharjee *et al*., 2006, for the US; Adermon and Liang,

2010, for Sweden; and Danaher *et al.,* 2012, for France). Special relevance should be given to the latter study, , which explored how the Hadopi (2009) legislation affected digital music sales in the iTunes music store in France. They use a broad set of European countries as a control group and the results suggest that increased consumer awareness of the Hadopi law causes iTunes song and album sales to increase by 23 and 25 per cent respectively relative to changes in the control group.

Overall, based on these previous findings, it is possible to state the next hypothesis:

> ***Hypothesis 1:*** *There is an inverse relationship between file sharing activity and revenues in the music industry.*

### 2.2.2. BUSINESS MODEL DEVELOPMENT

Some of the reasons to analyze the business models used in the music industry can be found in the literature. In this sense, Oberholzer-Gee and Strumpf (2007) found no correlation between file sharing and the decrease in revenues in the music industry. Elberse (2010) shows that unbundling offer has produced a decreased in the sales. Danaher et al. (2010) show that sales of NBC content removed from iTunes in 2007 decreased substantially and were recovered once they were included again in the catalogue of iTunes in 2008. In this sense, digital stores such iTunes may help to recover non-buyers or file sharers.

The term Business Model here refers to the design of the value creation, delivery and capture mechanisms employed by an enterprise to entice customers to pay for value, and convert those payments to profit (Teece, 2010). Differences between the business model and strategy lies within three areas (Chesbrough and Rosenbloom, 2002): business models start at value creation for the customer whereas strategy places more emphasis upon value capture and sustainability; the business model assumes

knowledge is cognitively limited and biased by a firms previous success, whereas strategy assumes careful analytics based upon reliable and available information with little recognition of cognitive limitations; financing may not be as prominent in business models as in strategy.

Analysis of music business models (Molteni and Ordanini, 2003; Choi and Perez, 2007) shows that MP3 technology provided a turning point in the music market, as this file format facilitated the development of online offerings which increased the availability and choice for consumers (Graham *et al.*, 2004). Prior to this innovation a firm's competitive advantage was heavily dependent on high-street shops with limited stock space, competing on managerial capabilities in balancing stock and consumer demand. Digital music removed much of the supply side challenge, deliver operating efficiencies across the supply chain (Coltman *et al.*, 2001) and allowed the development of business models which integrate customer and supplier in a relationship (Sommer, 2003). This requires a re-evaluation of organizational strategies and learning capabilities of music vendors (Lin *et al.*, 2012). Music vendors need to differentiate their offerings to clearly demonstrate their value propositions to their customers (Burn and Ash, 2005). Digital music business models may encompass traditional physical unit sales, digital unit sales, streamed music, online radio and forums for consumer engagement and comment on content (Bustinza *et al.*, 2012). These additions to the product offering are likened to the servitization process, where firms are increasingly seeking revenue from services associated with their product (Vandermerwe and Rada, 1989).

Industry revenue decline suggests that the 'recipe' for a successful music business model has yet to be achieved (Baden-Fuller and Morgan, 2010). 'Unbundling', a common facet of the digital music business model where each

individual track from an album may be bought separately, produces a decrease in total industry revenue (Elberse, 2010). Danaher *et al.* (2010) show that file sharing of NBC content increased substantially when it was removed from iTunes in 2007. File sharing activity decreased and revenues were recovered once the content was restored to the iTunes catalogue in 2008. Therefore, digital stores such iTunes may provide revenue gains from those who may currently be non-buyers or illegally share files. Consequently customer demand may be stimulated through evolution and new business model development (Hilletofth, 2011; O'Cass and Ngo, 2011).

The online market is a high-velocity environment as demand, competition and technology are constantly changing (Wirtz *et al.*, 2007). Business models are built around delivering customer value but knowledge of innovation management in the music industry may be limited, exemplified by the negative impact of MP3 technology on revenue. To better understand how business models create value for customers firms have begun to more closely customers' analyse behaviour (Parry *et al.*, 2012). Understanding and development of successful business models may be seen as part of a more complex strategy, which would include lobbying for IPR protection to recover revenues. For all these reasons, a second hypothesis is created to test whether new business models can increase revenues:

> ***Hypothesis 2:*** *There is a positive relationship between new business models and recovering revenues in the music industry.*

## 2.3. EMPIRICAL ANALYSIS

### 2.3.1. DATA

A unique cross section questionnaire with 44,206 valid observations from 10 countries is exploited. Four continents are represented with a recognized bias towards Europe as 6 European countries are represented, with 2 countries from North America

and 1 country each for Asia and Oceania. The questionnaire and responses formed part of a global survey conducted between September and December 2010 by one of the 'Big 3' global music companies with the objective of gaining insight into music consumer behaviour (Informa Telecoms & Media, 2010). A representative sample of the general population is given by random sampling. This sample has been proved to be valid in a recent study by Parry *et al.* (2012).

Available comparisons between digital file sharing activities and business models are shown in Table 2.1. Data from different sources attempts to quantify and measure file sharing activity. In the sample period IFPI (2011) data for illegal file sharing is available only for Spain, but is similar to the primary data used in this study.

**Table 2.1. Estimations of the Scale of Music Piracy**

| | DIGITAL PIRACY | | | | |
|---|---|---|---|---|---|
| | Peitz&Waelbroeck (2004) Period: 2001-2002* | Liebowitz (2006) Period: 2005** | Waldfogel (2010) Period: 2010*** | IFPI (2011) Period: 2011 | Industry Data Period: 2010 |
| Spain | 39% | -- | -- | 45% | 44% |
| Netherlands | 40% | -- | -- | -- | 39% |
| Italy | 46% | -- | -- | -- | 34.9% |
| Canada | 44% | -- | -- | -- | 31.8% |
| US | 40% | 13% | 48.6% | -- | 26.7% |
| Australia | 37% | -- | -- | -- | 23.9% |
| France | 34% | -- | -- | -- | 22.7% |
| UK | 28% | -- | -- | -- | 20.5% |
| Japan | 20% | -- | -- | -- | 17.7% |
| Germany | 34% | -- | -- | -- | 14.1% |
| Total | 38% | -- | -- | -- | 28.2% |

Waldfogel (2010) surveyed 500 US graduate students in 2010 and showed that of a sample of 50 popular songs students on average possess 7.63 legally purchased and 7.20 illegally downloaded songs, suggesting piracy in the US accounts for half of music consumption. Compared to other estimates of US piracy this figure is consistent with Peitz and Waelbroeck (2004) who estimate levels in 2001 at 40 per cent and is inconsistent with Liebowitz (2006) who estimate 13 per cent during 2005. The author's conservative estimation, 27 per cent, falls between previous studies.

In the primary data 53.5 per cent of the individuals responding to all the questions chose not to answer the question related to their music file sharing activity. This leaves a question: is the behaviour of the 46.5 per cent that chose to respond to this question representative of the whole population, or do they differ? If they differ the usual methodology employed for missing data, of taking into consideration only the respondents of each question, could create errors within the given estimate. Further analysis of the non-respondent group was undertaken to give different estimates of file sharing activity dependent on the assumptions made regarding the distribution and attitudes of this group.

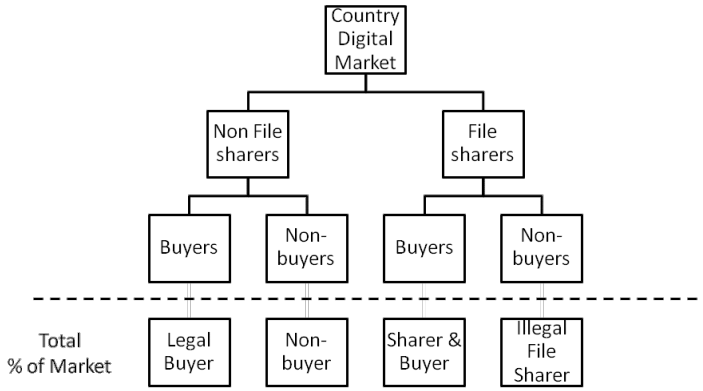
### 2.3.2. ESTIMATES OF FILE SHARING ACTIVITY AND BUSINESS MODELS CHALLENGE

A dummy variable, named *File Sharers / Non File Sharers,* is generated by the ordinal response [1=Very often; 2=Often; 3=Occasionally; 4=Rarely; 5= Never] to the question: "*How frequently do you normally download music files without paying...?"*. Here a *File Sharer* is taken to be an individual who illegally downloads music very often or often and a *Non-File Sharer* one who does this occasionally, rarely or never. This provides a conservative estimate to construct the proxy for file sharers.

A proxy for defining a digital buyer is generated using the question: "*Does your music collection contain Digital downloads that you paid for?"* This is a dummy variable, named *Digital Buyers / Non Digital Buyers*.

The variable analysis and consumer categories follow the flow shown in Figure 2.2. Initially a *File Sharer / Non-File Sharer* dyad of consumers is created. Analysis of these subgroups identifies if consumers buy digital music or not, creating the groups *Buyers Digital*/ *Non-Buyer Digital*. An estimate is then made of the total size by population of each sub-group: the group called *Legal Buyers* who legally purchase digital music; the group *Non-buyers* who buy no digital music; *Sharer & Buyer* who both buy digital music and illegally file share; and *Illegal File Sharers* who only have illegally shared digital music, with results shown in Table 2.2.

**Figure 2.2. Structure of Analysis**




Aggregating all countries together shows that 28.2 per cent of the population illegally file share. Approximately half of those who file share also pay for digital music, though the other half do not pay for any of the digital music they consume. From the 71.8 per cent of the population who respect intellectual property rights 68.6 per cent are *Buyers of Digital* music and 31.4 per cent are *Non-Buyers of Digital* music. Legal Buyers virtually make up half of the full population (49.2 per cent) and further action is not required with regards this group in the analysis. 22.5 per cent of the population are currently disengaged with the digital market.

**Table 2.2. Digital sales; Business models vs. Piracy (Only respondents all survey)**

| | Non-File Sharers | | File Sharers | |
|---|---|---|---|---|
| | 71.8% | | 28.2% | |
| **AGGREGATE** | Buyers Digital | Non-Buyers Digital | Buyers Digital | Non-Buyers Digital |
| Observations: 20,550 | 68.6% | 31.4% | 46.5% | 53.5% |
| Market total | Legal Buyers | Non-buyers | Sharer & Buyer | Illegal File Sharer |
| | 49.3% | 22.5% | 13.1% | 15.1% |
| | Non-File Sharers | | File Sharers | |
| | 56% | | 44% | |
| **SPAIN** | Buyers Digital | Non-Buyers Digital | Buyers Digital | Non-Buyers Digital |
| Observations: 2,514 | 37.8% | 62.2% | 28.6% | 71.4% |
| Market total | Legal Buyers | Non-buyers | Sharer & Buyer | Illegal File Sharer |
| | 21.2% | 34.8% | 12.6% | 31.4% |
| | Non-File Sharers | | File Sharers | |
| | 61% | | 39% | |
| **NETHERLANDS** | Buyers Digital | Non-Buyers Digital | Buyers Digital | Non-Buyers Digital |
| Observations: 1,388 | 43.9% | 56.1% | 29.2% | 70.8% |
| Market total | Legal Buyers | Non-buyers | Sharer & Buyer | Illegal File Sharer |
| | 26.8% | 34.2% | 11.4% | 27.6% |
| | Non-File Sharers | | File Sharers | |
| | 65.1% | | 34.9% | |
| **ITALY** | Buyers Digital | Non-Buyers Digital | Buyers Digital | Non-Buyers Digital |
| Observations 2,119 | 57.6% | 42.4% | 39.4% | 60.6% |
| Market total | Legal Buyers | Non-buyers | Sharer & Buyer | Illegal File Sharer |
| | 37.4% | 27.6% | 13.8% | 21.2% |
| | Non-File Sharers | | File Sharers | |
| | 68.2% | | 31.8% | |
| **CANADA** | Buyers Digital | Non-Buyers Digital | Buyers Digital | Non-Buyers Digital |
| Observations: 2,638 | 70% | 30% | 54.9% | 45.1% |
| Market total | Legal Buyers | Non-buyers | Sharer & Buyer | Illegal File Sharer |
| | 47.7% | 20.4% | 17.5% | 14.4% |
| | Non-File Sharers | | File Sharers | |
| | 73.3% | | 26.7% | |
| **US** | Buyers Digital | Non-Buyers Digital | Buyers Digital | Non-Buyers Digital |
| Observations: 2,364 | 80.6% | 19.4% | 61.1% | 38.9% |
| Market total | Legal Buyers | Non-buyers | Sharer & Buyer | Illegal File Sharer |
| | 59.1% | 14.2% | 16.3% | 10.4% |
| | Non-File Sharers | | File Sharers | |
| | 76.1% | | 23.9% | |
| **AUSTRALIA** | Buyers Digital | Non-Buyers Digital | Buyers Digital | Non-Buyers Digital |
| Observations:2,422 | 78.6% | 21.4% | 59.1% | 40.9% |
| Market total | Legal Buyers | Non-buyers | Sharer & Buyer | Illegal File Sharer |
| | 59.8% | 16.3% | 14.1% | 9.8% |
| | Non-File Sharers | | File Sharers | |
| | 77.3% | | 22.7% | |
| **FRANCE** | Buyers Digital | Non-Buyers Digital | Buyers Digital | Non-Buyers Digital |
| Observations: 1,774 | 62.4% | 37.6% | 38.8% | 61.2% |
| Market total | Legal Buyers | Non-buyers | Sharer & Buyer | Illegal File Sharer |
| | 48.2% | 29.1% | 8.8% | 13.9% |
| | Non-File Sharers | | File Sharers | |
| | 79.5% | | 20.5% | |
| **UK** | Buyers Digital | Non-Buyers Digital | Buyers Digital | Non-Buyers Digital |
| Observations: 2,021 | 86.9% | 13.1% | 68% | 32% |
| Market total | Legal Buyers | Non-buyers | Sharer & Buyer | Illegal File Sharer |
| | 69% | 10.4% | 14% | 6.6% |
| | Non-File Sharers | | File Sharers | |
| | 82.3% | | 17.7% | |
| **JAPAN** | Buyers Digital | Non-Buyers Digital | Buyers Digital | Non-Buyers Digital |
| Observations: 1,682 | 66.7% | 33.3% | 56.7% | 43.3% |
| Market total | Legal Buyers | Non-buyers | Sharer & Buyer | Illegal File Sharer |
| | 54.9% | 27.4% | 10% | 7.7% |
| | Non-File Sharers | | File Sharers | |
| | 85.8% | | 14.2% | |
| **GERMANY** | Buyers Digital | Non-Buyers Digital | Buyers Digital | Non-Buyers Digital |
| Observations: 1,628 | 83% | 17% | 54.6% | 45.4% |
| Market total | Legal Buyers | Non-buyers | Sharer & Buyer | Illegal File Sharer |
| | 71.3% | 14.6% | 7.7% | 6.4% |

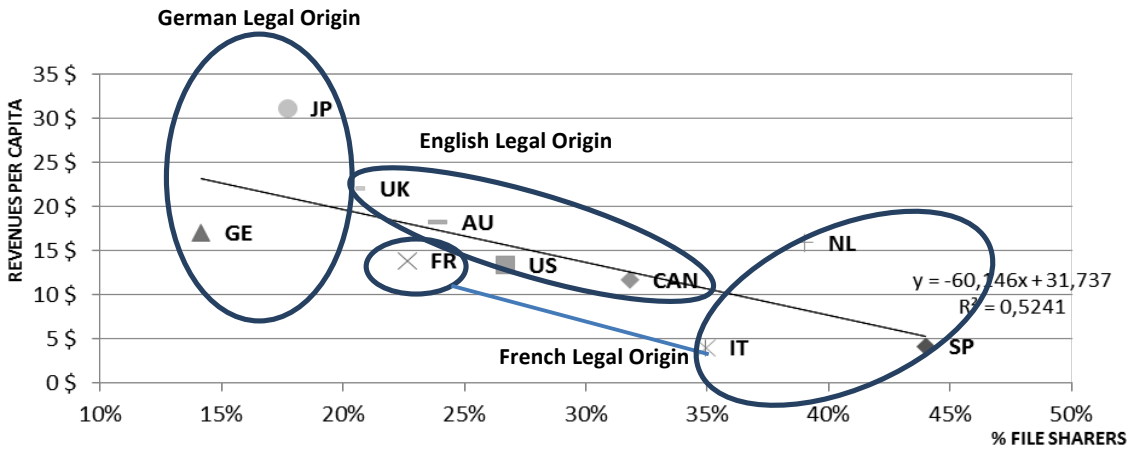
This group of population may be converted to digital purchase through new business models or marketing campaigns. As they do not file share legislation is unlikely to impact upon their behaviour. Sharer & Buyers make up 13.1 per cent and Illegal File Sharers represent 15.1 per cent of the full population. Their attitudes may be influenced by both legislative action and new business model development.

In order to analyze for homogeneity analysis is replicated at the country level. Findings are not homogeneous across countries. Two countries, Spain and Netherlands, have few legitimate buyers as a proportion of total population (<30 per cent). Findings show that Italy, Spain and the Netherlands have relatively high piracy rates. The population who only engage in illegal file sharing in Spain is 31.4 per cent, Netherlands 27.6 per cent and Italy 21.2 per cent. In recognition of this issue Spain has introduced The Law on the Sustainable Economy, also known as the Sinde-Wert Act, to protect intellectual property rights (Batuecas-Caletrio and Aparicio-Vaquero, 2012; Spain IIPA, 2012). Italian Regulatory Communication Authority (AGCOM) was formed in December 2010 and is developing legal reforms to protect IPR (Italy IIPA, 2012). To our best knowledge, so far the Netherlands have not announced any intent to legislate.

Germany is the country with the lowest relative piracy, 14.1 per cent, lower than France, where piracy is at 22.7 per cent, despite France having introduced the Hadopi (2010) law to tackle illegal file sharing one year before the survey was undertaken. Germany may be used as a target benchmark for an achievable rate of illegal file sharing under current market conditions. Japan has the second lowest file sharing activity and in exploring links it was found that Japan and Germany share legal origin, (Djankov *et al.* 2002). They are the only 2 countries with German legal origin included in the analysis. The other countries have either French Legal Origin (France, Spain, Netherlands and Italy) or English Legal Origin (UK, US, Australia and Canada) which

cluster into distinct groups when percentage file sharing is plotted against revenue (see Figure 2.3). Further analysis is required to test how meaningful this correlation is.

**Figure 2.3. File Sharing Challenge (Subsample) with Legal Origins**




The UK is the country with the most successful revenue and business model mix, with 69 per cent legal buyers and 20.5 per cent level of piracy. Only 10.4 per cent of the population has left the music market. Whilst the US, Canada and Australia share similarities in terms of language, economic development, legal origin and culture as a group they differ from the UK. Piracy is 25-30 per cent in the population, 50-60 per cent are legitimate buyers, leaving 15-20 per cent as a potential business model challenge.

### 2.3.3. DIGITAL MARKET OUTSIDERS

The group of non-file sharers and non-digital buyers are currently described as excluded from the digital market but not necessarily as a consequence of a business model challenge. Table 2.3 provides analysis of this group which makes up 22.5 per cent of the sample. The smallest sub-group, 1.2 per cent, is identified as financially constrained, disclosing that they are unemployed, and so have no disposable income to spend on music. A second group of people are those who claim to have no interest in music, making up 5.6 per cent of the sample. 4.2 per cent of the aggregate sample buys music, but only in physical format, reflecting the low revenues generated by physical

sales. The remaining 11.4 per cent are those with a latent passion for music but who are currently not engaged, representing a challenge for those developing business models.

**Table 2.3. Disentangling Non File Sharers - Non Digital Buyers**

| Country | Non File Shar/ Non Dig. Buyer | Financially Constrained | Not Interested | Buy Physical | Pure Business Model Challenge |
|---|---|---|---|---|---|
| Spain | 34.8% | 2.9% | 5.4% | 5.6% | 20.9% |
| Netherlands | 34.2% | 1.4% | 11.2% | 3.6% | 18% |
| Italy | 27.6% | 1.6% | 7.1% | 5% | 13.9% |
| Canada | 20.4% | 1.4% | 5.6% | 4.1% | 9.3% |
| US | 14.2% | 0.5% | 3.1% | 2.9% | 7.7% |
| Australia | 16.3% | 0.0% | 4.1% | 3.8% | 8.4% |
| France | 29.1% | 2.0% | 7.6% | 6.6% | 13% |
| UK | 10.5% | 0.4% | 3.2% | 2.6% | 4.4% |
| Japan | 27.4% | 1.2% | 10.1% | 3.7% | 12.4% |
| Germany | 14.6% | 0.6% | 2.1% | 4.2% | 7.7% |
| **Aggregate** | 22.5% | 1.2% | 5.7% | 4.2% | 11.4% |

An issue within this analysis is that the question disclosing File sharing is answered only by 20,550 consumers, while digital buying is answered by 44,206. The difference is large and whilst we do not have evidence as to their motivation, it is likely a result of respondents resisting self-incrimination though answering this question (Mercado-Kierkegaard, 2005). This privilege is recognised by the European Court of Human Rights (Funke v. France 1993; Ernest Saunders v. United Kingdom 1997). An analysis of them introduces a new group (*Don't Respond*) detailed in data section.

*'What happens with the group of population that does not want to disclose their piracy behaviour?'* In Table 2.4 the sample is split into consumers that claim to be file sharers, consumers that claim to be non-file sharers and consumers that avoid answering this question. 53.5 per cent of the population avoids answering this question, with homogeneity across countries ranging from 44.2 per cent in Spain to 59 per cent in Japan. Three options are considered here as to why people avoided answering this

question: first, they do not want to self-incriminate as they are file sharers. In this scenario total file sharing activity will equal the sum of the non-respondents and explicitly recognized file sharers. Homogeneity would exist across countries and file sharing activity would be between ~63 per cent (Australia, UK and Germany) and ~72 per cent (Netherlands and Italy); second, non-respondents follow a similar distribution to the rest of the sample. If this is the case the results remain the same as offered in Table 2.2; finally, they are not familiar with digital products and services and are Non-File Sharers. In the latter scenario the Business Model challenge rises on average to ~65 per cent of population and piracy is a smaller issue, being Spain the country with maximum level of piracy (24.6 per cent of the population) and Germany the country with the minimum one (6 per cent of the population).

With the objective of clarifying the general reason for not responding to the question on file sharing behaviour Table 2.5 analyzes the characteristics of File Sharers, Non-File Sharers and Don't Respond groups, reporting mean values and standard deviation for the following set of variables:

- Dummy Variables: Digital and Physical buying behaviour.
- Counting variables: Hours listened voluntarily per week and age.
- Likert Scale Variables: Consumers were asked about for their passion for music, their willingness for buying music legitimately, and their willingness to acquire music without paying.

**Table 2.4. Business Models vs. Piracy (All respondents)**

| | Non-File Sharers | | Don´t Respond | | File Sharers | |
|---|---|---|---|---|---|---|
| | 33.4% | | 53.5% | | 13.1% | |
| **AGGREGATE** | Buyers Digital | Non-Buyer | Buyers | Non-Buyer | Buyers Digital | Non-Buyer |
| Observations: 44,2 | 68.6% | 31.4% | 2.9% | 97.1% | 46.5% | 53.5% |
| Market total | Legal Buyers | Non-Buyers | Buyers | No-Buyers | Buyers & | Illegal File- |
| | 22.9% | 10.5% | 1.5% | 52% | 6,1% | 7% |
| | Non-File Sharers | | Don´t Respond | | File Sharers | |
| | 31.2% | | 44.2% | | 24.6% | |
| **SPAIN** | Buyers Digital | Non-Buyer | Buyers | Non-Buyer | Buyers Digital | Non-Buyer |
| Observations: | 37.8% | 62.2% | 1.7% | 98.3% | 28.5% | 71.5% |
| Market total | Legal Buyers | Non-Buyers | Buyers | Non-Buyers | Buyers & | Illegal File- |
| | 11.8% | 19.4% | 0.7% | 43.5% | 7% | 17.6% |
| | Non-File Sharers | | Don´t Respond | | File Sharers | |
| | 27.8% | | 54.4% | | 17.8% | |
| **NETHERLAN** | Buyers Digital | Non-Buyer | Buyers | Non-Buyer | Buyers Digital | Non-Buyer |
| Observations: | 43.9% | 56.1% | 2.4% | 97.6% | 29.2% | 70.8% |
| Market total | Legal Buyers | Non-Buyers | Buyers | Non-Buyers | Buyers & | Illegal File- |
| | 12.2% | 15.6% | 1.3% | 53.1% | 5.2% | 12.6% |
| | Non-File Sharers | | Don´t Respond | | File Sharers | |
| | 27.3% | | 58% | | 14.7% | |
| **ITALY** | Buyers Digital | Non-Buyer | Buyers | Non-Buyer | Buyers Digital | Non-Buyer |
| Observations 5,045 | 57.5% | 42.5% | 2% | 98% | 39.4% | 60.6% |
| Market total | Legal Buyers | Non-Buyers | Buyers | Non-Buyers | Buyers & | Illegal File- |
| | 15.7% | 11.6% | 1.2% | 56.8% | 5.8% | 8.9% |
| | Non-File Sharers | | Don´t Respond | | File Sharers | |
| | 35.3% | | 48.2% | | 16.5% | |
| **CANADA** | Buyers Digital | Non-Buyer | Buyers | Non-Buyer | Buyers Digital | Non-Buyer |
| Observations: | 70% | 30% | 3.5% | 96.5% | 54.9% | 45.1% |
| Market total | Legal Buyers | Non-Buyers | Buyers | Non-Buyers | Buyers & | Illegal File- |
| | 24.7% | 10.6% | 1.7% | 46.5% | 9.1% | 7.4% |
| | Non-File Sharers | | Don´t Respond | | File Sharers | |
| | 34.6% | | 52.8% | | 12.6% | |
| **US** | Buyers Digital | Non-Buyer | Buyers | Non-Buyer | Buyers Digital | Non-Buyer |
| Observations: | 80.6% | 19.4% | 2.8% | 97.2% | 61.1% | 38.9% |
| Market total | Legal Buyers | Non-Buyers | Buyers | Non-Buyers | Buyers & | Illegal File- |
| | 27.9% | 6.7% | 1.5% | 51.3% | 7.7% | 4.9% |
| | Non-File Sharers | | Don´t Respond | | File Sharers | |
| | 36.4% | | 52.1% | | 11.5% | |
| **AUSTRALIA** | Buyers Digital | Non-Buyer | Buyers | Non-Buyer | Buyers Digital | Non-Buyer |
| Observations:5,065 | 78.6% | 21.4% | 4.5% | 95.5% | 59.1% | 40.9% |
| Market total | Legal Buyers | Non-Buyers | Buyers | Non-Buyers | Buyers & | Illegal File- |
| | 28.6% | 7.8% | 2.3% | 49.8% | 6.8% | 4.7% |
| | Non-File Sharers | | Don´t Respond | | File Sharers | |
| | 33.5% | | 56.7% | | 9.8% | |
| **FRANCE** | Buyers Digital | Non-Buyer | Buyers | Non-Buyer | Buyers Digital | Non-Buyer |
| Observations: | 62.4% | 37.6% | 2.2% | 97.8% | 38.8% | 61.2% |
| Market total | Legal Buyers | Non-Buyers | Buyers | Non-Buyers | Buyers & | Illegal File- |
| | 20.9% | 12.6% | 1.3% | 55.4% | 3.8% | 6% |
| | Non-File Sharers | | Don´t Respond | | File Sharers | |
| | 36.3% | | 54.3% | | 9.4% | |
| **UK** | Buyers Digital | Non-Buyer | Buyers | Non-Buyer | Buyers Digital | Non-Buyer |
| Observations: | 86.9% | 13.1% | 4.2% | 95.8% | 68% | 32% |
| Market total | Legal Buyers | Non-Buyers | Buyers | Non-Buyers | Buyers & | Illegal File- |
| | 31.5% | 4.8% | 2.3% | 52% | 6.4% | 3% |
| | Non-File Sharers | | Don´t Respond | | File Sharers | |
| | 33.7% | | 59% | | 7.3% | |
| **JAPAN** | Buyers Digital | Non-Buyer | Buyers | Non-Buyer | Buyers Digital | Non-Buyer |
| Observations: | 66.7% | 33.3% | 1.9% | 98.1% | 56.7% | 43.3% |
| Market total | Legal Buyers | Non-Buyers | Buyers | Non-Buyers | Buyers & | Illegal File- |
| | 22.5% | 11.2% | 1.1% | 57.9% | 4.1% | 3.2% |
| | Non-File Sharers | | Don´t Respond | | File Sharers | |
| | 36.6% | | 57.4% | | 6% | |
| **GERMANY** | Buyers Digital | Non- | Buyers | Non-Buyer | Buyers Digital | Non-Buyer |
| Observations: | 83% | 17% | 3.8% | 96.2% | 54.5% | 45.5% |
| Market total | Legal Buyers | Non-Buyers | Buyers | Non-Buyers | Buyers & | Illegal File- |
| | 30.4% | 6.2% | 2.2% | 55.2% | 3.3% | 2.7% |

**Table 2.5. Characteristics of Non-File Sharers, File Sharers and Don't Respond**

| | Non-File Sharers | | Do not Respond | | File Sharers | | Total Sample | |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Dev. | Mean | Std. Dev. | Mean | Std. Dev. | Mean | Std. Dev. |
| Digital Buyer | 69.1% | 0.5 | 3% | 0.2 | 46.1% | 0.5 | 31.1% | 0.5 |
| Physical Buyer | 33.3% | 0.5 | 30.4% | 0.5 | 25.1% | 0.4 | 30.1% | 0.5 |
| Hours per week | 3.0 | 3.2 | 2.5 | 3.1 | 4.0 | 3.8 | 2.9 | 3.3 |
| Age | 38.5 | 15.2 | 44.8 | 16.6 | 31.1 | 14 | 40.9 | 16.5 |
| "I have Passion for Music" | 4.1 | 0.8 | 3.9 | 0.9 | 4.4 | 0.7 | 4 | 0.9 |
| "I do not want to risk downloading" | 3.7 | 1.4 | 3.8 | 1.4 | 2.6 | 1.4 | 3.6 | 2.5 |
| "I prefer to acquire music without paying" | 2.5 | 1.4 | 2.2 | 1.4 | 3.7 | 1.3 | 1.4 | 1.5 |

The percentage of buying physical is 30.1 per cent and digital at 31.2 per cent in the total sample. However, the distribution is quite different. As shown in Table 2.5, only 3 per cent of the group that do not respond to the file sharing question buy digital music, but 30.1 per cent buy music in physical format. This percentage is close to that for Non-File Sharers, 33.3 per cent, and larger than the File Sharers, 25.1 per cent. Therefore it cannot be concluded that the Do not Respond group are non-buyers, they simply have different preferences when buying and they listen to fewer hours of music per week; 2.5 hours in comparison with 2.9 hours of Non-File Sharers and 3.8 hours for File Sharers. The Do not Respond group is less passionate about music than the other groups, which correlates with their average age ~45 years; older than File Sharers at 31.1 and Non-File Sharers at 38.5 years old. To explore the view that the Do not Respond group may be not be illegal file sharers two control variables were included; their willingness to buy music legitimately and download music without paying. On average the group place greatest value on buy music legitimately, a value of 3.8 compared to 2.6 for File Sharers. The group also has the lowest value for acquiring music without paying: 2.2 compared to 3.7 for File Sharers.

### 2.3.4. FILE SHARING ACTIVITY, BUSINESS MODEL ISSUES AND SALES PER CAPITA

In this analysis, illegal file sharing has been related to an individual's attitude towards buying music, but it does not include average spending. International Federation of the Phonographic Industry (IFPI) data presents national average expenditure per capita for the year 2010. Figures range from US$4 in Italy to US$31 in Japan. In Figures 2.5 to 2.9 the different measures of file sharing activity and business model issues are related to the true value of sales per capita. As with Table 2.2, Figures 2.2, 2.4 and 2.5 assume that the Do not Respond group follows the same distribution of those who answered the question. Figures 2.6 and 2.7 assume non-

respondents are File Sharers and Figures 2.8 and 2.9 assume they are Non-File Sharers.

**Figure 2.4. File Sharing Challenge (Subsample)**

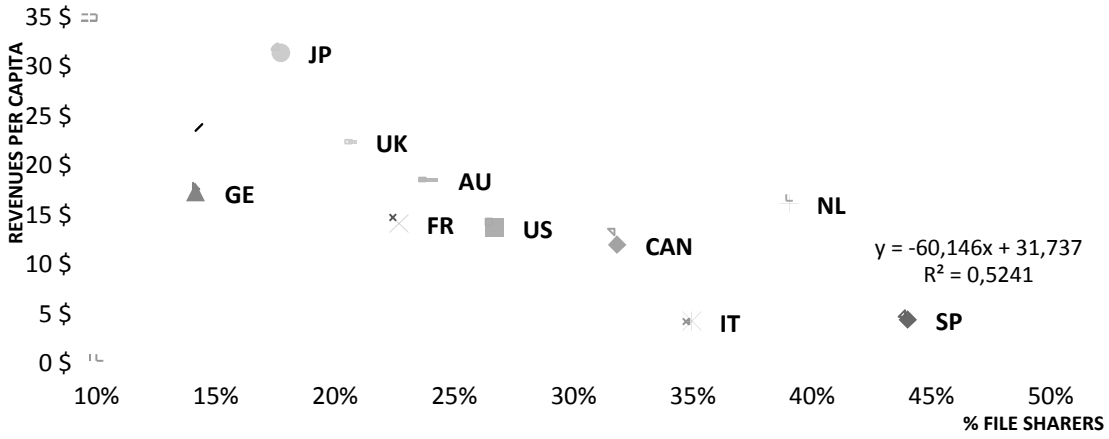



**Figure 2.5. Business Model Challenge (Subsample)**

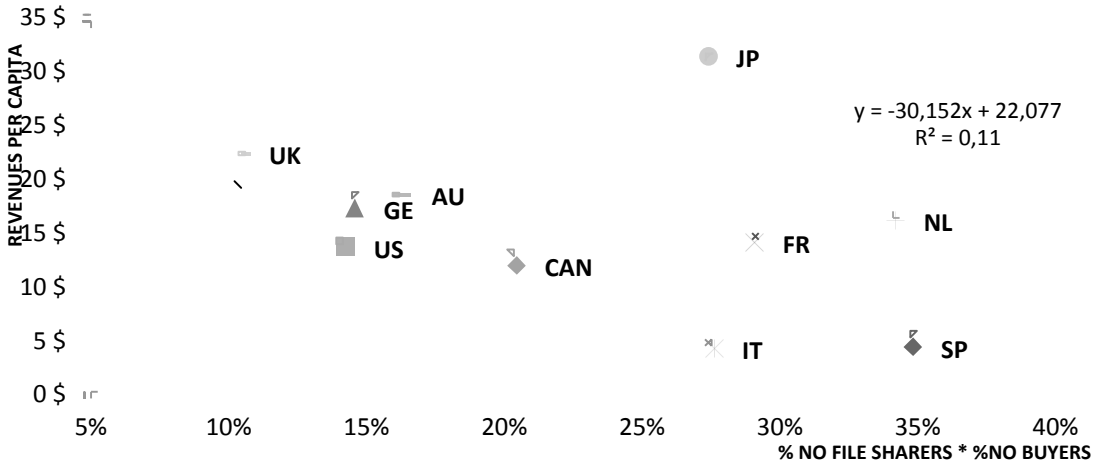



**Figure 2.6. File Sharing Challenge (Full sample)**

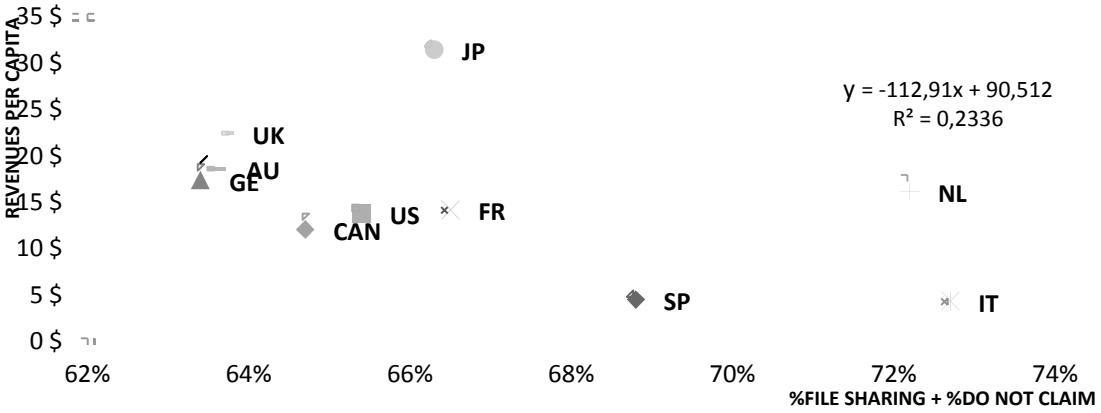


**Figure 2.7. Business Model Challenge (Full sample)**

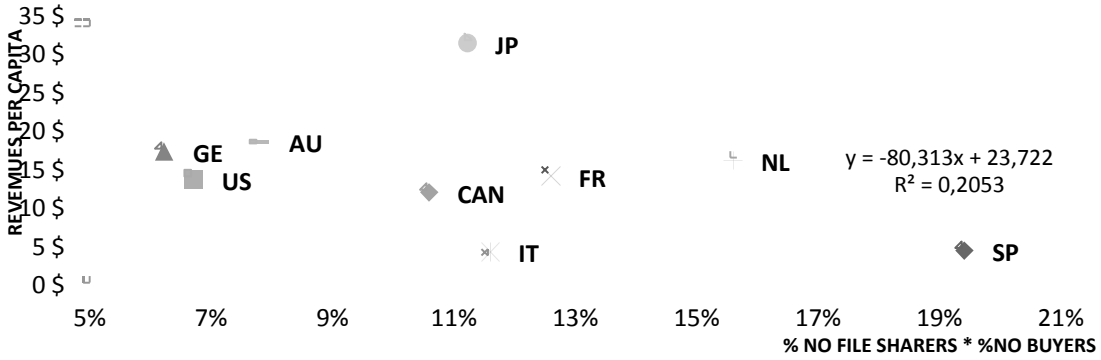



**Figure 2.8. File Sharing Challenge (Full sample)**

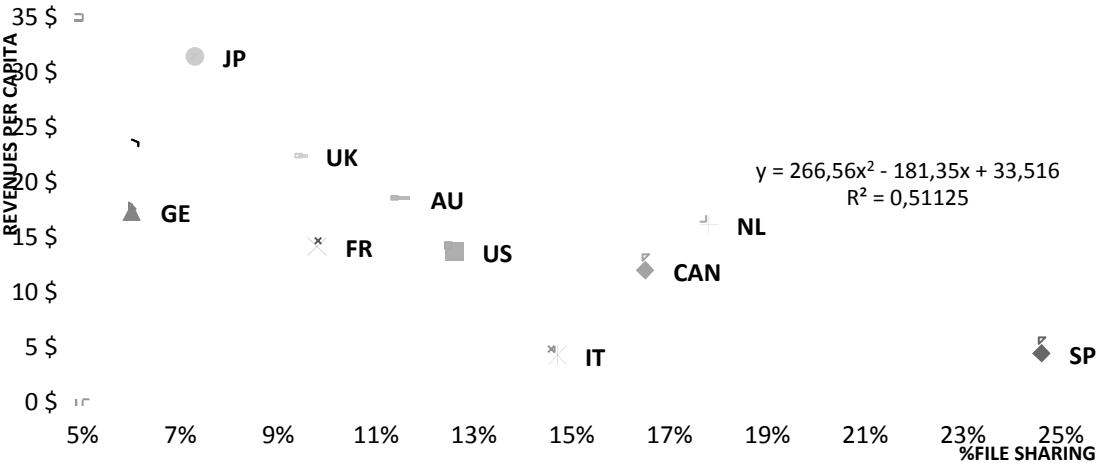
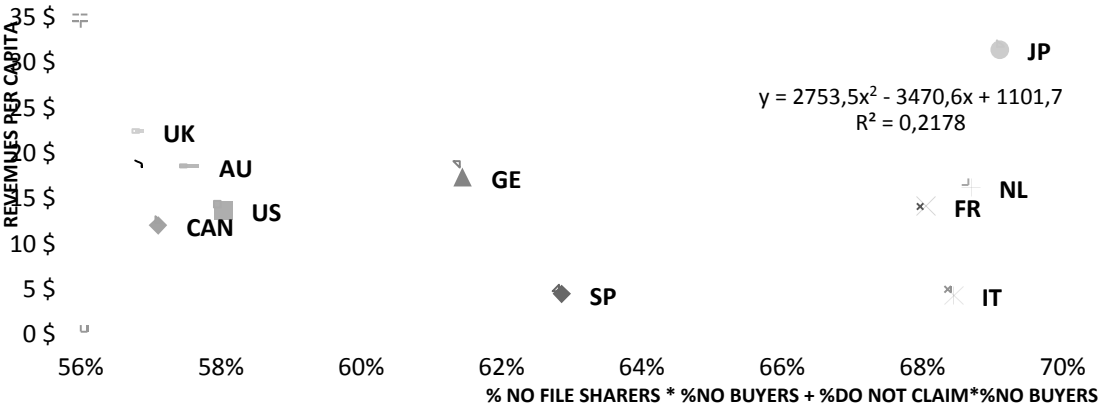



**Figure 2.9. Business Model Challenge (Full sample)**




In Figure 2.4 a negative relationship is observed between file sharing activity and sales per capita ($R^2$>0.5) supporting the literature (Hong, 2004; Rob and Waldfogel, 2004; Bhattacharjee *et al.*, 2006; Michel, 2006; Zentner, 2006; Liebowitz,

2008). The line of best-fit has a highly negative slope, -60, such that a reduction of 1 per cent in file sharing gives a rise of US$0.6 in expenditure per capita. Therefore, Hypothesis 1 is accepted. In Figure 2.5, a negative relationship exists between business model issues and sales per capita ($0.1<R^2<0.2$), supporting the literature (Burn and Ash, 2005; O'Cass and Ngo, 2011; Parry *et al.*, 2012). Therefore, Hypothesis 2 is accepted.

When it is assumed that non- respondents to the file sharing question are Non-File Sharers (Figure 2.9) a quadratic relationship is observed, casting doubt upon the validity of the assumption. It seems illogical to suggest that the country with highest sales per capita (i.e. Japan) is faced with a significant business model challenge. However, this is a high velocity environment and may indicate future challenges for this market. Future work including data on streamed services, both illegal and legal, may better inform this argument.

## 2.4. DISCUSSION

The empirical literature analyzing the evolution of the music industry during the last decade has emphasized the role of piracy as the main explanation for the decrease of revenues. We corroborate in this research that file sharing is a common activity around the world with a unique and valuable sample of 10 countries and more than 44,000 data points. We estimate that on average 28.2% of the population usually participates in the file sharing networks, with a minimum of 14% in Germany and a maximum of 44% in Spain. In addition, we find a negative and strong correlation between file sharing and sales per capita agreeing with Liebowitz (2008) findings. But, is the piracy problem the only responsible for the crisis in the music industry?.

The work challenges the assumption that piracy is solely responsible for the revenue decline in the music industry. With the digitalization of music the dynamics of

the music market have dramatically changed. Many new music business models reflect a theoretical shift in understanding what music retail is, presenting music to consumers not as a product but as a service (Parry *et al.*, 2012). Examples include pay as you go business models exemplified by Apples *iTunes* and pay monthly models exemplified by *Spotify* (Osterwalder and Pigneur, 2010). The transformation may have excluded some consumers from the market, described in this study as a Business Model Challenge. According to the analysis presented this challenge accounts for ~22.5 per cent of the population, only six percentage points below the level of file sharing at ~28.2 per cent. Of the 50.7 per cent of the consumers who find themselves outside the legal market, only 28.2 per cent of them may be recovered through legislation aimed at reducing piracy; supporting H1 and calling for a stronger IPR regulation. The remainder of the sample must be recovered through business model innovation, providing access to music in a way that better suits this groups requirements; supporting H2.

A correlation was observed between piracy level and the legal origins of the country (Djankov *et al.*, 2002). Countries with German legal origin seem less inclined to illegally file share than other countries. However, in discussions with industry experts they recognised that in Germany there have been numerous lawsuits against file-sharers over many years whilst in Japan piracy is seen as a growing issue with regards streaming over smart phones. Future research will explore this correlation and related issues.

This chapter also makes a methodological contribution. Only 46.5 per cent of the survey respondents are willing to answer the question regarding their file sharing activities. This opens a debate: do the non-respondents follow a similar distribution to the respondents with regards their attitude to file sharing? Three scenarios are used to

enable the redistribution of respondents. First, as with previous research (Peitz and Waelbroeck, 2004; IFPI, 2011) it is assumed that non-respondents follow a similar distribution to respondents. Second, it is assumed that non-respondents are File Sharers. Third, non-respondents are assumed to be Non-File Sharers. The evidence would suggest that non-respondents tend to be closer to non-file sharing groups, the third assumption, as they are older and would appear to favour physical music purchases. However, accepting this assumption raises a paradox (see Figure 2.9): why would Japan, the country with the highest sales per capita, have the greatest business model challenge? This requires future research, as Japan may have a particular issue with piracy and streaming over mobile networks.

Inside the analysis of business models applied to services, a limitation of this study is that it analyzes the digital market without having data on the usage of streaming services (*Spotify*). Future research should cover this gap and correct the business model problem if it really is the case.

Finally, this study has also managerial and policy implications. Managers in the music industry may be aware that there is a huge proportion of the population that could be recovered using different business models or communication campaigns. Policy makers have new and comprehensive data about their piracy rates which can help compare them to benchmark levels of piracy.

# CHAPTER 3

## 3. TOWARDS AN UNDERSTANDING OF TRANSACTION COSTS AND CONSUMER BEHAVIOR: WHY DO THOSE WHO SHARE FILES ALSO PURCHASE?

**ABSTRACT**

Literature suggests that consumers substitute legal purchases for illegal downloads, a phenomenon called purchase substitution. Evidence shows that illegal file sharers may also make legal purchases, which begs the question 'why do people purchase when they have access to the resource for free?' Hypotheses based on transaction cost theory and the economics of property rights identify two possible explanations as to why illegal file sharers may also make purchases: they are sampling the market using illegal means before purchasing; they have a respect for property rights and guilt compels them to make a purchase. Digital markets are shown to suffer from purchase substitution which creates transaction costs and a loss in potential revenue for resource owners. As consumers are exposed to resource they may be influenced to purchase, however through sample exposure the consumer captures value from the resource owner through learning and purchases only the resources perceived to be of greatest value. Purchase substitution in digital markets is partially alleviated through increasing a consumer's belief in property rights. For file sharers with a likelihood of purchase greater than 60% exposure to resource increases their likelihood of purchase. However, data provides no volume or value for such purchases and data would suggest the value is low. In the physical market consumers behavior is predominantly influenced by their beliefs in property rights.

## 3.1. INTRODUCTION

The creative industries revenues have been affected by disruptive digital innovations such as the MP3 file compression format and broadband Internet connection which has allowed consumers to easily share the industries resource output (Tidd, Bessant and Pavitt, 2011). New digital content formats drive new business models and move consumers away from purchasing physical content and towards digital consumption (Daniels, 2006). The music industry reached a peak in physical format sales in 2004 and the motion-picture industry did it in 2006. On the other hand, consumers of printed books maintain a preference for the physical product, whilst videogames producers have delayed the full digitalization of their market through the efficient use of digital rights management combined with a requirement to purchase physical elements (Kartas and Goode, 2012). Therefore, the music industry would appear to be leading the transition to a predominantly digital market and may provide lessons for other industries.

The music industry faces an on-going threat to revenue from illegal file sharing of their resource, music content, amongst their potential consumers. Liebowitz (2006) suggests the predominant effect of illegal file sharing is purchase substitution, where file sharers substitute their legal purchases for illegally downloaded content, accessing the desired resource free from economic cost (Liebowitz, 2008; Parry et al., 2012). File sharers capture provider value by evaluating resource prior to purchase, the sample exposure effect, which is a provider revenue stream via radio and TV licensing (Liebowitz, 1985, 2006; Blackburn, 2004; Gopal et al., 2006). Consumers who illegally access content may experience a psychological cost, linking property rights to feelings of guilt (Henning-Thurau et al., 2007).

Research has found that globally 46.5% of illegal file sharers also pay for content; in economic terms this is irrational behavior (Bustinza et al., 2013). The analysis presented here seeks to explain why someone still pays when they can access the content for free.

The main contribution of this study is to empirically explore the conduct of consumers who display seemingly contradictory patterns of behavior, shedding light on the process of consumption (De Canniere et al., 2009) and the role of ethics in consumer behavior (Carrington et al., 2012) consolidating studies in this area. Research draws upon 18,842 cross-section observations made in 2010 of consumers residing in 10 different countries. The results identify the presence of a group of individuals who believe in the legitimacy of illegally sharing music, a variable described hereafter as the "Robin Hood" tendency, which represents a novelty in consumer behavior analysis.

The study is organized as follows. The next section describes the theoretical underpinning which is followed by hypotheses development. The study then presents empirical results and discusses theoretical and managerial implications of the findings.

### 3.2. THEORETICAL UNDERPINNING

The resource-based view (RBV) explains how firms' performance differs as a result of their utilization of resource (Barney 1991; Peteraf 1993; Teece 1980). Higher sustainable returns are achieved through the use of combinations of resources to form unique competences which are offered as value propositions to the market (Wernerfelt, 1984; Mills et al., 2003; Rugman and Verbeke 2002; Parry et al, 2010). Though definitions of resource differ in the RBV literature is a common tendency to see resources as units which form the building blocks for firm value creation. Foss and Foss (2005) propose that resources themselves are composed of bundles of Property

Rights which permit the use of the resources attributes. Attributes of resource give rise to different functionalities and services that the resource can supply. This is coherent with Penrose (1959) who suggests it is not the resource which provides an input to a process but rather the service that the resource can provide and Zimmerman's statement 'resources are not they become' (1951). Given this logic Property Rights are important as they provide a vehicle to give permission to utilize resource attributes such as the right to consume, obtain income from and alienate collective choice rights −that is to sell and lease such rights (Alchian, 1977; Barzel, 1997).

Transaction Cost Theory (TCT) is an appropriate theoretical framework for understanding the market cost associated with the behavior of consumers who exploit the attributes of resource. Transaction costs theory is built upon the Coase (1988) theorem which states that the maximum value that can be achieved from the exchange and use of economy's goods will be created when transaction costs are non-existent. The underlying assumptions are that in surplus-maximizing equilibrium all participants / agents in the market have full information with regards the use and attributes of resource, there are no bargaining costs, and defining and protecting resource property rights incurs no costs (Williamson, 1989). In the perfect market the costs of exchanging property rights are assumed to be zero, all property rights to all resource attributes can be exchanged and are optimally bundled into resources. There will still be constraints on the rights to use resources, but these constraints will be defined in a value-maximizing manner (Amit & Zott, 2001). To summarize, in the perfect market externalities cause no avoidable loss of value and given the optimal constraints and costless exchange, resources will be put to their best possible use and the maximum value that resources can create will be realized.

Real markets are not perfect or free of transaction costs. Transaction costs relate to information, contractual agreements, post-contractual risks and establishing and maintaining property rights (Allen, 199; Foss and Foss 2005). TCT as related to property rights is discussed through the lens of the economics of property rights (EPR) which provides an understanding of Property Rights distribution and management (Coase, 1988; Foss and Foss 2005). As with resource, to minimize transaction costs property rights are usually traded in bundles (Foss and Foss, 2001). Transaction costs exist in the exchange, capture, and protection property rights (Foss and Foss 2005). Specifically, *exchange transaction costs* are incurred during search and selection of resource, which links to concepts of availability of information about potential alternatives and price heterogeneity; *Capture transaction cost* refers to activities which appropriate value from other agents without compensating them. A supplier may capture valuable resource attributes from the buyer by lowering the pre-agreed quality of goods; a moral hazard (Chi, 1994); *Protection transaction costs* are resource consuming activities which reduce a third parties' incentives to capture resource property rights (Teece, 2007). Rights are protected if resources are costly to imitate or substitute, by deterring competitors from entering a market, by choosing governance structures to reduce moral hazard or hold-up problems, by using legal systems or by writing contracts, and these approaches all incur a cost.

In the next section the empirical hypotheses are developed. Grounded within economics of property rights theory and linked to relational behaviors (Kim, 2007) the analysis is set within the context of the music industry, being the analysis focused in exchange transaction cost and purchase substitution.

## 3.3. HYPOTHESES DEVELOPMENT

### 3.3.1. EXCHANGE TRANSACTION COST AND PURCHASE SUBSTITUTION

'Purchase Substitution' happens when consumers illegally copy a file which then acts as a substitute for a legal purchase (Liebowitz, 2006). Individuals who engage in illegal file sharing gain new content at zero cost, but the resource owner incurs an exchange transaction cost as they lose potential revenue. Theoretically the total market value of illegally obtained files stored on a computer may be seen to equate to the exchange transaction cost incurred by the resource owner as file sharers have no legal claim over the resource attributes of copying, distribution or use (Foss and Foss, 2005). Assuming perfect substitution, where the quality and information contained in the copy is the same as the original, there is no economic reason for file sharers to pay for a resource and attributes that can be obtained for free. In extremis the existence of purchase substitution implies that all those engaging in illegal file sharing provide no revenue for the resource owners as they demonstrate an unwillingness to pay. However, the presence of a behavioral direction such as file sharing moderates but does not dominate an individual's attitude towards purchase of an item (Yuksel and Mryteza, 2009). Implicit in the discussion of purchase substitution is the assumption that illegal file-sharers are less likely to make a purchase. Earlier studies deploy three different empirical strategies to test the existence of purchase substitution in the context of the creative industries.

The first strategy is undertaken by Liebowitz (2008) and it uses aggregate data collected during the development and roll-out of broadband internet services in the U.S. from 1998 to 2003. The natural experiment links broadband penetration and sales per capita in 99 U.S. cities and identifies different patterns at the city level. A negative and significant relationship is found between internet penetration and industry

revenue, a result which may be interpreted to corroborate but not prove the existence of purchase substitution. Analysis at an aggregate level requires heterogeneity between the units of analysis. With the datasets available to authors heterogeneity may currently only be observed at country rather than a city or regional level (Bustinza et al., 2013) which consequently makes it difficult to replicate Liebowitz' (2008) analysis.

A second empirical strategy uses consumer survey data to gain an understanding of consumer needs and attitudes. Studies which exploit survey data identify a negative and significant correlation between file sharing and purchasing attitudes (Hong, 2004; Michel, 2006; Rob and Waldfogel, 2004; Zentner, 2006). Taking the last reference as an example, Zentner (2006) finds that file sharing reduces the probability of purchase by up to 30%.

A third empirical strategy draws conclusions from real market data. Oberholzer and Strumpf (2007) provide a direct test for purchase substitution, using actual file sharing data. Audio file downloads are paired with the relevant commercially available counterparts and the resulting correlation is found to be significantly negative. However, correlation does not necessarily imply causality. To test causality Oberholzer and Strumpf use an instrumental variable method of analysis (Arellano and Bover, 1995) and correlate international school holidays with the endogenous explicative variable, illegal downloads, which is uncorrelated with the error term. Once this instrumental variable is introduced into their econometric models the link between file sharing and sales becomes statistically insignificant, leading Oberholzer-Gee and Strumpf (2007) to conclude that file sharing does not have a significant negative impact on sales. Their paper rejects the existence of purchase substitution.

Taking into account all the previous literature, in this study the first empirical hypothesis to be tested states the existence of purchase substitution behavior, which represents exchange transaction costs for the provider, via the likelihood that illegal file sharers will not purchase.

***Hypothesis 1:*** *File Sharers have a lower likelihood of purchasing than non-file sharers.*

### 3.3.2. CAPTURE TRANSACTION COST AND SAMPLE EXPOSURE

Gopal et al. (2006) argue that file sharing is a complex phenomenon which has a small positive effect on purchasing as many of those who illegally access files will later make a purchase. Exposure to content is a mechanism through which consumers acquire prior knowledge about a resource. Access to resource enables consumers to evaluate them –the process of sample exposure– before making an informed purchasing decision (Liebowitz, 2006). Through the process of sorting and learning consumers capture value from vendors as they are able to select resources which they perceive to be of higher value and reject others perceived of lesser value (Foss and Foss, 2005). Consumers may sample many resources before selecting which, if any, they will purchase. When examined through the lens of sample exposure the market value of illegally obtained files stored on a computer only represents a percentage of the total market value which could have been realized.

Consistent with the sample exposure argument is the work of Blackburn (2004) who shows that in the music industry the exposure effect is greater for the work of unknown artists. Non-file sharers also experience sample exposure through channels such as streaming services (e.g. YouTube, Spotify), TV or Radio, extrapolating sample exposure to the general population.

Several empirical studies examine sample exposure effects. Chi (2008) uses a representative survey of more than 60,000 households in the US and Canada for the period 2004-2006 and his results show that illegal file sharing increases the probability of purchase. Chi identifies both substitution and sample exposure effects and concludes that the latter dominates the former, but caveats that the work refers to probability of purchase, not volume so it is possible that file-sharers who purchase may only spend a few dollars whilst non-file-sharers may spend significantly more. Andersen and Frenz (2010) use a survey of more than 2,000 Canadian respondents and initially find no evidence that file sharing influences the sale of music CD albums. After substituting the 'file sharing' variable for two variables measuring substitution effect and sample exposure, they find that the two coefficients have similar value with different sign and conclude that they cancel one another out, leaving no evidence of a relationship between files sharing and album sales.

Two hypotheses are constructed to test the influence of sample exposure on consumer purchasing behavior.

***Hypothesis 2a:*** *Exposure to music increases the likelihood that all consumers will buy music.*

***Hypothesis 2b:*** *The likelihood of an increase in music purchase resulting from exposure to music will be larger for file sharers than for non-file sharers.*

### 3.3.3. PROTECTION TRANSACTION COST AND CONSUMER RESPECT FOR PROPERTY RIGHTS

This study assumes that two main factors determine an individual's respect for property rights, influencing their decision to purchase or illegally access resource attributes. The first factor is legislation and the second the individuals beliefs.

Legislation, usually in the form of copyright protection, is the primary means for protecting resource attributes as it provides a simplified group approach, reducing

protection transaction costs for resource owners (Lunney, 2001). Examples of legislation covering digital resource from two of the larger European markets are the French *Haute Autorité pour la diffusion des œuvres et la protection des droits sur internet* [Hadopi] (2010) and the United Kingdom's Digital Economy Act (2010). Whilst these acts differ in detail both focus upon internet users, with sanctions against illegal user behaviour based on a graduated response model. The acts provide a proportionate approach that involves a system of notifications and warnings which culminate in deterrent sanctions for individuals who refuse to stop infringing on property rights. By definition legislation as a factor is controlled by third parties (i.e. judges, policy makers).

Belief in copyright as a legitimate means of property rights protection creates a psychological cost, incurred by a person who acts illegally (Hennig-Thurau et al., 2007). Levi et al. (2009) conceptualise legitimacy as the factors which create a sense of obligation that can translate into an individual's willingness to comply with regulations and laws. French and Raven (1959) refer to legitimacy as social influence induced by feelings of "should", "ought to", and "has a right to", which appeal to an "internalized norm or value". Consequently, consumers are categorized into three different groups according to their beliefs and actions with regards to property rights. The first group believes existing regulations are legitimate and act legally, so create no protection transaction costs. The second group agrees with the spirit of property rights legislation but for reasons such as financial difficulties acts illegally and incurs a psychological transaction cost. The third group believes that illegally copying and distributing digital resource is a legitimate form of behavior and exhibits what the authors describe as a 'Robin Hood' tendency. Those with a high value related to the Robin Hood tendency are expected to have a low probability of purchase.

The relationship between respect for property rights and propensity to purchase is empirically under-explored. Sinha and Mandel (2008) relate individual's perceived risk of being caught for illegal file sharing to their willingness to pay. Taking a sample of 273 undergraduate business students in 2005, an increase in the perceived risk of being caught is found to slightly lower the tendency to file share in the general population. However, an increase in perceived risk is also found to increase the likelihood of illegal file sharing amongst those with a high risk tolerance.

To test the influence of personal belief in property rights on protection transaction costs the following hypotheses are constructed.

***Hypothesis 3a****: Respect for property rights increases the likelihood that all consumers will buy music.*

***Hypothesis 3b****: The relationship between illegal file sharers and their likelihood of purchasing resource is positively moderated by their respect for property rights*

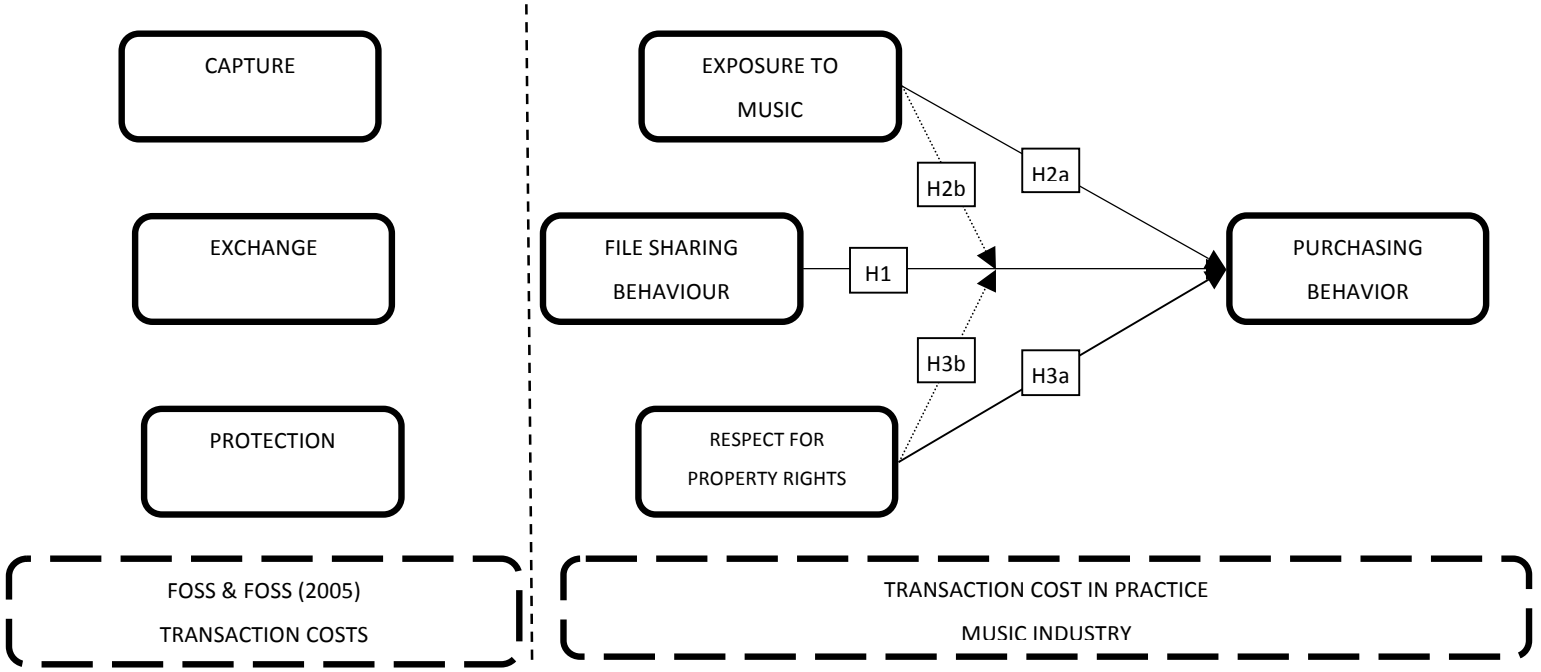
Figure 3.1 summarizes the model and hypotheses showing the variables to be estimated, which are explained in detail in next section.

## 3.4. DATA AND METHOD

### 3.4.1. ASSESSMENT OF THE MUSIC INDUSTRY

The music industry is led by 3 major music-licensing firms who hold over 60% of the market share in terms of property rights to music resource. Industry revenues have been in sharp decline over the past decade (Parry et al., 2012). Daniels (2006) describes the chronology of the digital crisis which has impacted revenues in the creative industry suggesting that the music industry leads movies, games and book publishing industries.

**Figure 3.1. Connection between the Theoretical Underpinning and Empirical Relations Predicted**



Music consumer surveys collected by one of the 'Big 3' global music companies from ten different countries provide data concerning individual characteristics, beliefs, file sharing activity and music consumption patterns are used in this study. Survey data has an important advantage in respect to other typologies of data as transactional data and aggregated data lacks information regarding the antecedents and context of an individual's file sharing behaviour. With survey data it is possible to analyse the behavioural motivations and develop upon the theoretical foundations discussed previously. Specifically, the data contains 18,842 observations from ten different countries: Spain, Germany, France, Italy, Netherlands, UK, US, Canada, Australia and Japan (for a detailed sample description see Bustinza et al., 2013).

### 3.4.2. MEASURES AND DESCRIPTIVE STATISTICS

Customer information enables an estimation of the demand function to be made based on logistic regressions. Demand is modeled as a function of individual customer's specific characteristics, country specific effects, and music consumption behavior. Table 3.1 presents the descriptive statistics for all the variables in this article.

*Purchasing behavior*

The dependent variable is binary and takes the value 1 when the consumer buys music in a given year and 0 otherwise. 70.8% of the individuals in the sample are buyers, split further into *physical* buyers, *digital* buyers and consumers that buy *both* formats. According to Hausman (1978) and Hausman and McFadden (1984), these are independent alternatives, justifying separate analysis (see Appendix 1). When compared to non-buyers 57.1% of consumers have a propensity to only purchase music in digital format and 19% of the consumers have a propensity to purchase only physical formats.

*Customer specific characteristics*

A consumer's consumption pattern depends upon their age and gender. Personal wealth and passion for the content affect access to products and services.

- *Gender* is a binary variable that takes the value 1 when the consumer is a male and 0 when is a female. The sample is 53% male, see Table 3.1.

- *Age* of consumers is a continuous variable. The average consumer is 36 years old. In later analyses the age variable is normalized using logarithmic transformation.

- *Working Status* is a variable divided in to 5 categories. 36.6% of all respondents are full time employees, 21.4% are part time employees, 7.8% are unemployed, 15.8% are out of the job market (house workers or retired) and 18.4% are students. Unemployed people have been taken as the baseline group in the analysis.

- *Passion for music* is a categorical variable constructed by asking individuals if music is important in their life. 84.6% of the sample answers affirmatively.

- *Passion for technology* is a categorical variable constructed by asking individuals if they love technology and if music is a big part of that technology. 52.7% respond affirmatively.

*Country specific effects*

Data for ten different countries provide information on how consumers differ as a result of market conditions and culture. Two explicative country-specific variables control for this heterogeneity.

- *Geographical Continent:* The sample countries are catalogued into America, Europe and Australasia regional areas. The distribution of observations across areas is 24.5%, 55.3% and 20.2%, respectively (see Table 3.1). Three dummy variables create this information, being America the baseline group.

- *Legal Origin* is an indicator of the rule of law and acts as a general proxy for the effects of regulations in the economy and culture (Djankov et al., 2002). The countries

analyzed are catalogued the legal origins of their governance frameworks, namely French 37.2% of respondents (France, Spain, Netherlands, Italy), English 46.5% (UK, US, Australia, Canada) and German 16.3% (Germany and Japan), Table 3.1. Three dummy variables create this information and in further analysis English Legal origin forms the baseline group.

**Table 3.1. Descriptive Statistics**

| | | Obs | Mean | Std. Dev. |
|---|---|---|---|---|
| Dependent Variables | PrBuy | 18,842 | 0.71 | 0.45 |
| | PrBuy Digital | 12.805 | 0.57 | 0.49 |
| | PrBuy Physical | 6.784 | 0.19 | 0.39 |
| | PrBuy Both | 10,237 | 0.46 | 0.50 |
| Generic Individual Variables | Gender | 18.842 | 0.53 | 0.50 |
| | Age | 18.842 | 36.10 | 15.10 |
| | Income Full Time | 18.842 | 0.37 | 0.48 |
| | Income Part Time | 18.842 | 0.21 | 0.41 |
| | Out of Job Market | 18.842 | 0.16 | 0.36 |
| | Unemployed | 18.842 | 0.08 | 0.27 |
| | Passion for Technology | 18.842 | 0.53 | 0.50 |
| | Passion for Music | 18,842 | 0.85 | 0.36 |
| Country Specific Variables | America | 18.842 | 0.24 | 0.43 |
| | Europe | 18.842 | 0.55 | 0.50 |
| | Australasia | 18.842 | 0.20 | 0.40 |
| | French Legal Origin | 18.842 | 0.37 | 0.48 |
| | English Legal Origin | 18.842 | 0.46 | 0.50 |
| | German Legal Origin | 18,842 | 0.16 | 0.37 |
| Music Industry individual variables | File Sharing Behavior | 18.842 | 0.28 | 0.45 |
| | Hours listened week | 18.842 | 3.30 | 3.40 |
| | Robin Hoods | 18,842 | 0.00 | 1.00 |

*Music consumption behavior*

- *File Sharing Behavior:* following methodology in chapter 1, is a binary variable constructed by asking individuals if they download music that they do not pay for. The variable identifies 28.5% as illegal file sharers.

- *Exposure to music* is a continuous variable expressing the hours listened per week. The average of this variable is of 3.3 hour per week and it has been normalized into logarithms.

- *Robin Hood*: According to Lafuente et al. (2010), factor load predictions are a good measure for independent variables as long as they are continuous and by

definition follow a normal distribution. A measure for individuals respect for property rights is created. Three items form a five-point Likert scale measuring an individual's Robin Hood tendency (see Table 3.2), with 56.5% of the items' variance explained. Analysis of the scale's internal consistency yields a Cronbach's alpha value of $\alpha$ = 0.92. Using Confirmatory Factor Analysis the composite liability is calculated as 0.83 with an average extracted variance over 0.5. These values confirm this is a good instrument for measuring the variables (Hair et al., 2001).

**Table 3.2. Items Measuring Robin Hood Tendency**

| |
|---|
| ***Robin Hood Tendency*** |
| ROB1.- I am not willing to pay for music; |
| ROB2.- I prefer to risk downloading music illegally rather than buying it legitimately; |
| ROB3.- I prefer to acquire music without paying (ie. download from file-sharing sites, etc.). |

### 3.4.3. EMPIRICAL METHODOLOGY

A logistic regression is appropriate to estimate demand functions. A given consumer has a propensity to buy music $y_i^*$, linearly related to a vector of observable variables, $x_i$ (the explicative variables presented above) and non-observable factors collected in the error term, $\varepsilon_i$:

$$y_i^* = \beta x_i + \varepsilon_i \tag{3.1}$$

When $y_i$* is greater than 0 the consumer decides to buy music. A consumer's propensity to buy music cannot be observed, only their actual choice, which is called $y_i$ and gives a value of 1 when the consumer buys and 0 otherwise. The probability that $y_i=1$ is given by equation 3.2, where $\beta$ is the vector of coefficients to be estimated.

$$P(y_i = 1|x_i) = \frac{\exp(x_i'\beta)}{1+\exp(x_i'\beta)})) \tag{3.2}$$

The coefficients ($\beta$) in equation 3.1 are used to accept or reject hypothesis though their size is not economically relevant. An estimate of the slope or marginal

effect is used to quantify the economic effect of a particular explicative variable (Greene, 2003). Ai and Norton (2003) show that common inconsistencies occur with software used to estimate the marginal effects of interactive terms. For instance, the interaction effect is conditional on the independent variables and may have different signs for different values of covariates. To interpret binary choice models appropriately calculation of the graphical marginal effects of interactive terms is required (Ai and Norton, 2003; Hoetker, 2007; Zelner, 2009).

To estimate the model in equation 3.3 the dependent variables above are collected under the heading Buy. Interactive terms are estimated in separate models and the corrected marginal effects are presented graphically. *Z* represents a vector of the country specific effects and *I* a vector that contains information of the individual characteristics. $\beta_n, \beta_{1n}, \mu, \gamma$ are the estimated parameters. Table 3.3 shows how variables relate to each coefficient and their predicted sign. Results are shown in Tables 3.4 to 3.7 and Figures 3.2 to 3.17.

$$Buy_i = \alpha + \sum_{n=1}^{3} \beta_n X_{ni} + \sum_{n=2}^{3} \beta_{1n} X_{1i} X_{ni} + \mu Z_i + \gamma I_i + \varepsilon_i \quad (2.1.3)$$

**Table 3.3. Hypotheses Summary**

| Theoretical argumentation | Hypothesis | Variable measuring the theoretical construct | Parameter analyzed | Predicted sign | Result |
|---|---|---|---|---|---|
| Purchase substitution | H1 | File Sharing | $\beta_1$ | Negative | Digital market accepted<br>Physical market rejected |
| Sample substitution | H2a | Hours per week | $\beta_2$ | Positive | Accepted |
| | H2b | File Sharing*Hours per week | $\beta_{12}$ | Positive | Accepted for digital market. Rejected for physical market |
| Respect for property rights | H3a | Robin hoods | $\beta_3$ | Negative | Accepted |
| | H3b | File Sharing*Robin Hoods | $\beta_{13}$ | Negative | Accepted |

**Table 3.4. Logit Regression and Marginal Effects for Buying Music**

| **Buy** | Model (1) | | Model (2) | | Model (3) | |
|---|---|---|---|---|---|---|
| | Betas | Marginal Ef. | Betas | Marginal Ef. | Betas | Marginal Ef. |
| Gender | 0.12*** | 0.02*** | 0.12*** | 0.02*** | 0.12*** | 0.02*** |
| | (0.04) | (0.01) | (0.04) | (0.01) | (0.04) | (0.01) |
| Income Full-Time | 0.28*** | 0.05*** | 0.28*** | 0 .05*** | 0.28*** | 0.05*** |
| | (0.06) | (0.01) | (0.06) | (0.01) | (0.06) | (0.01) |
| Income Part-Time | 0.22*** | 0 .03*** | 0.22*** | 0 .03*** | 0.22*** | 0.03*** |
| | (0.06) | (0.01) | (0.06) | (0.01) | (0.06) | (0.01) |
| Out of Job Market | 0.18*** | 0 .03*** | 0.18*** | 0 .03*** | 0.18*** | 0.03*** |
| | (0.06) | (0.01) | (0.06) | (0.01) | (0.06) | (0.01) |
| Students | 0.10 | 0.01 | 0.10 | 0 .01 | 0.10 | 0.01 |
| | (0.07) | (0.01) | (0.07) | (0.01) | (0.07) | (0.01) |
| Ln(Age) | -0.10*** | -0.01** | -0.10** | -0.01** | -0.10** | 0.01** |
| | (0.04) | (0.00) | (0.04) | (0.00) | (0.04) | (0.01) |
| Passion for Technology | 0.47*** | 0 .08*** | 0.47*** | 0 .08** | 0.47*** | 0.08*** |
| | (0.04) | (0.00) | (0.04) | (0.01) | (0.04) | (0.01) |
| Passion for Music | 0.44*** | 0.08*** | 0.44*** | 0.08*** | 0.44*** | 0.08*** |
| | (0.05) | (0.01) | (0.05) | (0.01) | (0.05) | (0.01) |
| Europe | 0.43*** | 0 .07*** | 0.43*** | 0.07*** | 0.43*** | 0.07*** |
| | (0.07) | (0.01) | (0.07) | (0.01) | (0.07) | (0.01) |
| AusiAsia | 0.12* | 0 .02* | 0.12*** | 0.02* | 0.12* | 0.02* |
| | (0.06) | (0.01) | (0.06) | (0.01) | (0.06) | (0.01) |
| French LO | -1.20*** | -0.22*** | -1.19*** | -0.22*** | -1.19*** | -0.22*** |
| | (0.06) | (0.01) | (0.06) | (0.01) | (0.06) | (0.01) |
| German LO | -0.19*** | -0.03*** | -.019*** | -0.03*** | -0.18*** | -0.03 |
| | (0.07) | (0.01) | (0.07) | (0.01) | (0.07) | (0.01) |
| File Sharers ($X_1$) | -0.25*** | -0.04*** | -0.28*** | -0.05*** | -0.31*** | -0.05*** |
| | (0.04) | (0.01) | (0.06) | (0.01) | (0.05) | (0.01) |
| Ln(Hours per week) ($X_2$) | 0.12*** | 0.02*** | 0.10*** | 0 .01*** | 0.12*** | 0.02*** |
| | (0.02) | (0.01) | (0.03) | (0.01) | (0.02) | (0.01) |
| Robin Hood ($X_3$) | -1.05*** | -0.18*** | -1.05*** | -0.18*** | -1.07*** | -0.18*** |
| | (0.02) | (0.01) | (0.02) | (0.01) | (0.02) | (0.01) |
| $X_1$* $X_2$ | | | 0.03 | 0.01 | | |
| | | | (0.04) | (0.01) | | |
| $X_1$* $X_3$ | | | | | 0.07* | -0.01 |
| | | | | | (0.04) | (0.01) |
| Cons | 1.09*** | | 1.10** | | 1.10*** | |
| | (0.19) | | (0.19) | | (0.19) | |
| **Log likelihood** | -8,683.06 | | -8,682.76 | | -8,681.68 | |
| **Pseudo R2** | 0.23 | | 0.23 | | 0.23 | |
| **Corrected predicted Probability:** | | | | | | |
| Pr(Buy)=0 | | 47.67% | | 47.60% | | 47.72% |
| Pr(Buy)=1 | | 89.92% | | 89.90% | | 89.81% |
| Overall | | 77.60% | | 77.57% | | 77.54% |
| **Number of obs** | 18,842 | 18,842 | 18,842 | 18,842 | 18,842 | 18,842 |

Level of statistical significance: *** 1%, ** 5%, * 10%. Standard errors reported within parenthesis.

**Table 3.5. Logit Regression and Marginal Effects for Buying Digital Music**

| **Buy Digital** | Model (1) | | Model (2) | | Model (3) | |
|---|---|---|---|---|---|---|
| | Betas | Marginal Ef. | Betas | Marginal Ef. | Betas | Marginal Ef. |
| Gender | 0.15*** | 0.03*** | 0.15*** | 0.03*** | 0.16*** | 0.03*** |
| | (0.04) | (0.01) | (0.04) | (0.01) | (0.04) | (0.01) |
| Income Full-Time | 0.18*** | 0.04*** | 0.18*** | 0.04*** | 0.18*** | 0.04*** |
| | (0.06) | (0.01) | (0.06) | (0.01) | (0.06) | (0.01) |
| Income Part-Time | 0.12* | 0.02* | 0.12* | 0.03* | 0.12* | 0.02* |
| | (0.07) | (0.01) | (0.07) | (0.01) | (0.07) | (0.01) |
| Out of Job Market | 0.06 | 0.01 | 0.06 | 0.01 | 0.064 | 0.01 |
| | (0.07) | (0.01) | (0.07) | (0.01) | (0.07) | (0.01) |
| Students | 0.09 | 0.02 | 0.09 | 0.02 | 0.08 | 0.02 |
| | (0.08) | (0.02) | (0.08) | (0.02) | (0.08) | (0.02) |
| Ln(Age) | -0.22*** | -0.05*** | -0.22*** | -0.05*** | -0.22*** | -0.05*** |
| | (0.05) | (0.01) | (0.05) | (0.01) | (0.05) | (0.01) |
| Passion for Technology | 0.33*** | 0.07*** | 0.33*** | 0.07*** | 0.32*** | 0.07*** |
| | (0.04) | (0.01) | (0.04) | (0.01) | (0.04) | (0.01) |
| Passion for Music | 0.22*** | 0.05*** | 0.22*** | 0.05*** | 0.22*** | 0.05*** |
| | (0.05) | (0.01) | (0.05) | (0.01) | (0.056) | (0.01) |
| Europe | 0.35*** | 0.08*** | 0.36*** | 0.08*** | 0.35*** | 0.08*** |
| | (0.08) | (0.01) | (0.08) | (0.01) | (0.08) | (0.01) |
| AusiAsia | 0.13* | 0.03* | 0.13* | 0.03* | 0.13* | 0.03* |
| | (0.07) | (0.01) | (0.07) | (0.01) | (0.07) | (0.01) |
| French LO | -1.25*** | -0.29*** | -1.25*** | -0.29*** | -1.23*** | -0.29*** |
| | (0.07) | (0.01) | (0.07) | (0.01) | (0.07) | (0.01) |
| German LO | -0.17** | -0.04** | -0.17** | -0.04** | -0.16** | -0.04** |
| | (0.07) | (0.01) | (0.07) | (0.01) | (0.07) | (0.01) |
| File Sharers ($X_1$) | -0.31*** | -0.07*** | -0.39*** | -0.09*** | -0.47*** | -0.11*** |
| | (0.04) | (0.01) | (0.06) | (0.01) | (0.06) | (0.01) |
| Ln(Hours per week) | 0.02 | 0.00 | -0.01 | -0.01 | 0.02 | 0.01 |
| ($X_2$) | (0.02) | (0.00) | (0.03) | (0.01) | (0.02) | (0.01) |
| Robin Hood ($X_3$) | -0.93*** | -0.22*** | -0.93*** | -0.22*** | -0.99*** | -0.23*** |
| | (0.02) | (0.01) | (0.02) | (0.01) | (0.03) | (0.01) |
| $X_1$* $X_2$ | | | 0.08 | 0.01 | | |
| | | | (0.05) | (0.01) | | |
| $X_1$* $X_3$ | | | | | 0.20*** | 0.02* |
| | | | | | (0.05) | (0.01) |
| Cons | 1.39*** | | 1.41*** | | 1.43*** | 0.03*** |
| | (0.21) | | -(0.21) | | (0.21) | (0.01) |
| **Log likelihood** | -6,945.14 | | -6,943.87 | | -6,937.68 | |
| **Pseudo R2** | 0.20 | | 0.20 | | 0.20 | |
| **Corrected predicted Probability:** | | | | | | |
| Pr(Buy)=0 | | 63.04% | | 62.95% | | 63.84% |
| Pr(Buy)=1 | | 78.30% | | 78.24% | | 77.92% |
| Overall | | 71.75% | | 71.68% | | 71.88% |
| **Number of obs** | 12,805 | 12,805 | 12,805 | 12,805 | 12,805 | 12,805 |

Level of statistical significance: *** 1%, ** 5%, * 10%. Standard errors reported within parenthesis.

**Table 3.6. Logit Regression and Marginal Effects for Buying Music in Physical Format**

| **Buy Physical** | Model (1) | | Model (2) | | Model (3) | |
|---|---|---|---|---|---|---|
| | Betas | Marginal Ef. | Betas | Marginal Ef. | Betas | Marginal Ef. |
| Gender | -0.07 | -0.01 | 0.07 | -0.01 | -0.07 | -0.01 |
| | (0.06) | (0.01) | (0.06) | (0.00) | (0.06) | (0.01) |
| Income Full-Time | 0.38*** | 0.05*** | 0.38** | 0.05*** | 0.38*** | 0.05*** |
| | (0.11) | (0.01) | (0.11) | (0.01) | (0.11) | (0.01) |
| Income Part-Time | 0.30** | 0.04** | 0.30** | 0.04** | 0.30** | 0.04** |
| | (0.12) | (0.01) | (0.12) | (0.01) | (0.12) | (0.01) |
| Out of Job Market | 0.34*** | 0.04** | 0.33*** | 0.04** | 0.33*** | 0.04** |
| | (0.126 | (0.01) | (0.12) | (0.01) | (0.12) | (0.01) |
| Students | 0.26* | 0.03* | 0.26* | 0.03* | 0.27** | 0.03* |
| | (0.13) | (0.02) | (0.13) | (0.02) | (0.13) | (0.02) |
| Ln(Age) | 0.15* | 0.02* | 0.15* | 0.02* | 0.16* | 0.02* |
| | (0.08) | (0.01) | (0.08) | (0.01) | (0.08) | (0.01) |
| Passion for Technology | 0.42*** | 0.057*** | 0.42*** | 0.05*** | 0.43*** | 0.05*** |
| | (0.07) | (0.01) | (0.07) | (0.01 | (0.07) | (0.01) |
| Passion for Music | 0.85*** | 0.09*** | 0.85*** | 0.09*** | 0.86*** | 0.09*** |
| | (0.11) | (0.01) | (0.11) | (0.01) | (0.11) | (0.01) |
| Europe | 0.27* | 0.03** | 0.27* | 0.03** | 0.28** | 0.03** |
| | (0.14) | (0.01) | (0.14) | (0.01) | (0.14) | (0.01) |
| AusiAsia | 0.06 | 0.01 | 0.06 | 0.01 | 0.07 | 0.01 |
| | (0.12) | (0.01) | (0.12) | (0.01) | (0.12) | (0.01) |
| French LO | -0.28** | -0.03** | -0.28** | -0.03** | -0.29** | -0.03** |
| | (0.12) | (0.01) | (0.12) | (0.01) | (0.12) | (0.01) |
| German LO | -0.04 | -0.01 | -0.04 | -0.01 | -0.05 | -0.01 |
| | (0.13) | (0.01) | (0.13) | (0.01) | (0.13) | (0.01) |
| File Sharers ($X_1$) | 0.13* | 0.01* | 0.14 | 0.02 | 0.30*** | 0.04*** |
| | (0.07) | (0.01) | (0.10) | (0.01) | (0.08) | (0.01) |
| Ln(Hours per week) ($X_2$) | 0.15*** | 0.02*** | 0.15*** | 0.02*** | 0.14*** | 0.01*** |
| | (0.04) | (0.01) | (0.05) | (0.01) | (0.04) | (0.01) |
| Robin Hood ($X_3$) | -0.80*** | -0.10*** | -0.80*** | -0.10*** | -0.70*** | -0.09*** |
| | (0.03) | (0.01) | (0.03) | (0.01) | (0.04) | (0.01) |
| $X_1$* $X_2$ | | | -0.01 | -0.01 | | |
| | | | (0.08) | (0.01) | | |
| $X_1$* $X_3$ | | | | | -0.28*** | -0.04*** |
| | | | | | (0.08) | (0.01) |
| Cons | -2.90*** | | -2.90*** | | -2.96*** | |
| | (0.36) | | (0.36) | | (0.36) | |
| **Log likelihood** | -2,930.00 | | -2,929.97 | | -2,923.73 | |
| **Pseudo R2** | 0.11 | | 0.11 | | 0.11 | |
| **Corrected predicted Probability:** | | | | | | |
| Pr(Buy)=0 | | 97.96% | 98.00% | | | 98.09% |
| Pr(Buy)=1 | | 11.46% | 11.46% | | | 10.06% |
| Overall | | 81.49% | 81.52% | | | 81.32% |
| **Number of obs** | 6,784 | 6,784 | 6,784 | 6,784 | 6,784 | 6,784 |

Level of statistical significance: *** 1%, ** 5%, * 10%. Standard errors reported within parenthesis.

**Table 3.7**. **Logit Regression and Marginal Effects for Buying Digital and Physical Formats**

| **Buy Both** | Model (1) | | Model (2) | | Model (3) | |
|---|---|---|---|---|---|---|
| | Betas | Marginal Ef. | Betas | Marginal Ef. | Betas | Marginal Ef. |
| Gender | 0.11*** | 0.02** | 0.11** | 0.02** | 0.11** | 0.02** |
| | (0.05) | (0.01) | (0.05) | (0.01) | (0.05) | (0.01) |
| Income Full-Time | 0.55*** | 0.13*** | 0.55*** | 0.13*** | 0.55*** | 0.13*** |
| | (0.09) | (0.02) | (0.09) | (0.02) | (0.09) | (0.02) |
| Income Part-Time | 0.50*** | 0.12*** | 0.50*** | 0.12*** | 0.50*** | 0.12*** |
| | (0.09) | (0.02) | (0.09) | (0.02) | (0.09) | (0.02) |
| Out of Job Market | 0.47*** | 0.11*** | 0.47*** | 0.11*** | 0.47*** | 0.11*** |
| | (0.10) | (0.02) | (0.10) | (0.02) | (0.10) | (0.02) |
| Students | 0.20** | 0.05* | 0.20* | 0.05* | 0.20* | 0.05* |
| | (0.11) | (0.03) | (0.11) | (0.03) | (0.11) | (0.03) |
| Ln(Age) | 0.07 | 0.21*** | 0.07 | 0.21*** | 0.07 | 0.21*** |
| | (0.07) | (0.01) | (0.07) | (0.01) | (0.07) | (0.01) |
| Passion for Technology | 0.88*** | 0.22*** | 0.88*** | 0.22*** | 0.87*** | 0.22*** |
| | (0.05) | (0.01) | (0.05) | (0.01) | (0.05) | (0.01) |
| Passion for Music | 1.01*** | 0.01 | 1.01*** | 0.01 | 1.01*** | 0.01 |
| | (0.08) | (0.01) | (0.08) | (0.01) | (0.08) | (0.01) |
| Europe | 0.79*** | 0.18*** | 0.79*** | 0.18*** | 0.78*** | 0.18*** |
| | (0.10) | (0.02) | (0.10) | (0.02) | (0.10) | (0.02) |
| AusiAsia | 0.15** | 0.03* | 0.15* | 0.03* | 0.15* | 0.03* |
| | (0.09) | (0.02) | (0.09) | (0.02) | (0.09) | (0.02) |
| French LO | -1.58*** | -0.36*** | -1.58*** | -0.36*** | -1.58*** | -0.36*** |
| | (0.09) | (0.02) | (0.09) | (0.02) | (0.09) | (0.020) |
| German LO | -0.46*** | -0.11*** | -0.46*** | -0.11*** | -0.46*** | -0.11*** |
| | (0.09) | (0.02) | (0.09) | (0.02) | (0.09) | (0.02) |
| File Sharers ($X_1$) | -0.30*** | -0.07*** | -0.30*** | -0.07*** | -0.32*** | -0.07*** |
| | (0.06) | (0.01) | (0.10) | (0.02) | (0.07) | (0.01) |
| Ln(Hours per week) ($X_2$) | 0.29*** | 0.07*** | 0.29*** | 0.07*** | 0.29*** | 0.07*** |
| | (0.03) | (0.01) | (0.04) | (0.01) | (0.03) | (0.01) |
| Robin Hood ($X_3$) | -1.48*** | -0.36*** | -1.48*** | -0.36*** | -1.49*** | -0.36*** |
| | (0.03) | (0.01) | (0.03) | (0.01) | (0.04) | (0.01) |
| $X_1$* $X_2$ | | | -0.01 | -0.01 | | |
| | | | (0.07) | (0.01) | | |
| $X_1$* $X_3$ | | | | | 0.04 | 0.01 |
| | | | | | (0.07) | (0.01) |
| Cons | -1.81*** | | -1.81*** | | -1.81*** | |
| | (0.29) | | (0.29) | | (0.29) | |
| **Log likelihood** | -4,196.24 | | -4,196.24 | | -4,196.10 | |
| **Pseudo R2** | 0.40 | | 0.40 | | 0.40 | |
| **Corrected predicted Probability:** | | | | | | |
| Pr(Buy)=0 | 83.59% | | | 83.59% | | 83.65% |
| Pr(Buy)=1 | 78.67% | | | 78.67% | | 78.67% |
| Overall | 81.31% | | | 81.31% | | 81.34% |
| **Number of obs** | 10,237 | 10,237 | 10,237 | 10,237 | 10,237 | 10,237 |

Level of statistical significance: *** 1%, ** 5%, * 10%. Standard errors reported within parenthesis.

**Figure 3.2. Parameter of the Interaction Effect *Hours Listening_x_File Sharers* Depending on the Probability of Buy**

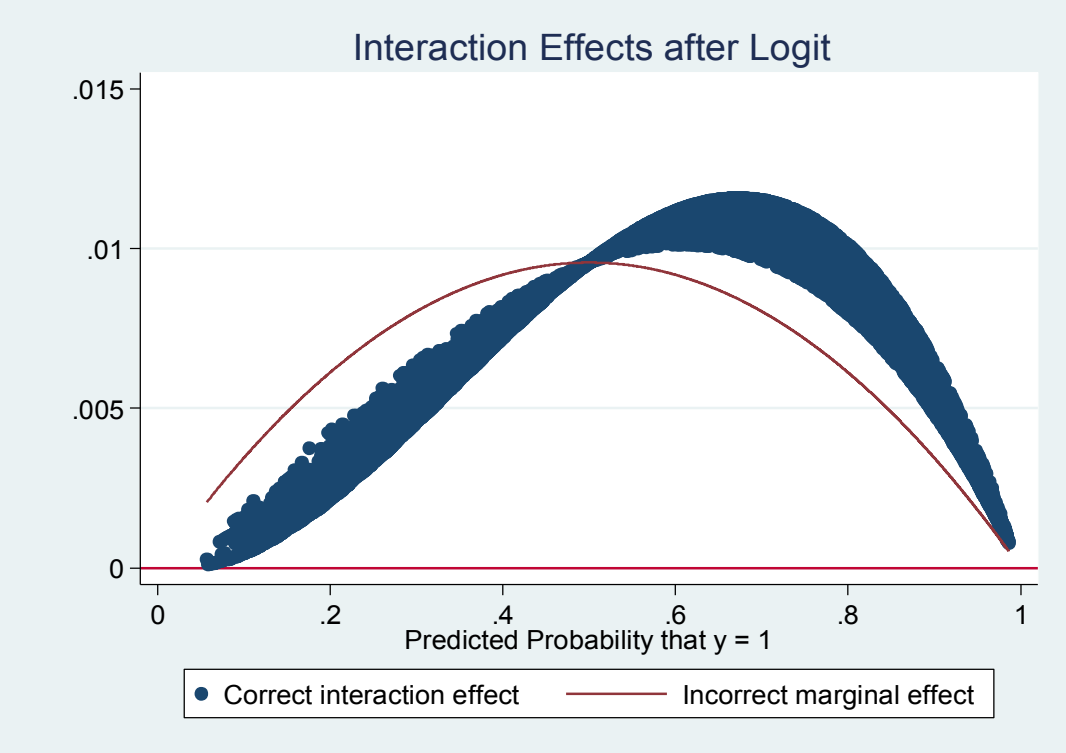



**Figure 3.3. Significance of the Interaction Effect *Hours Listening_x_File Sharers* Depending on the Probability of Buy**

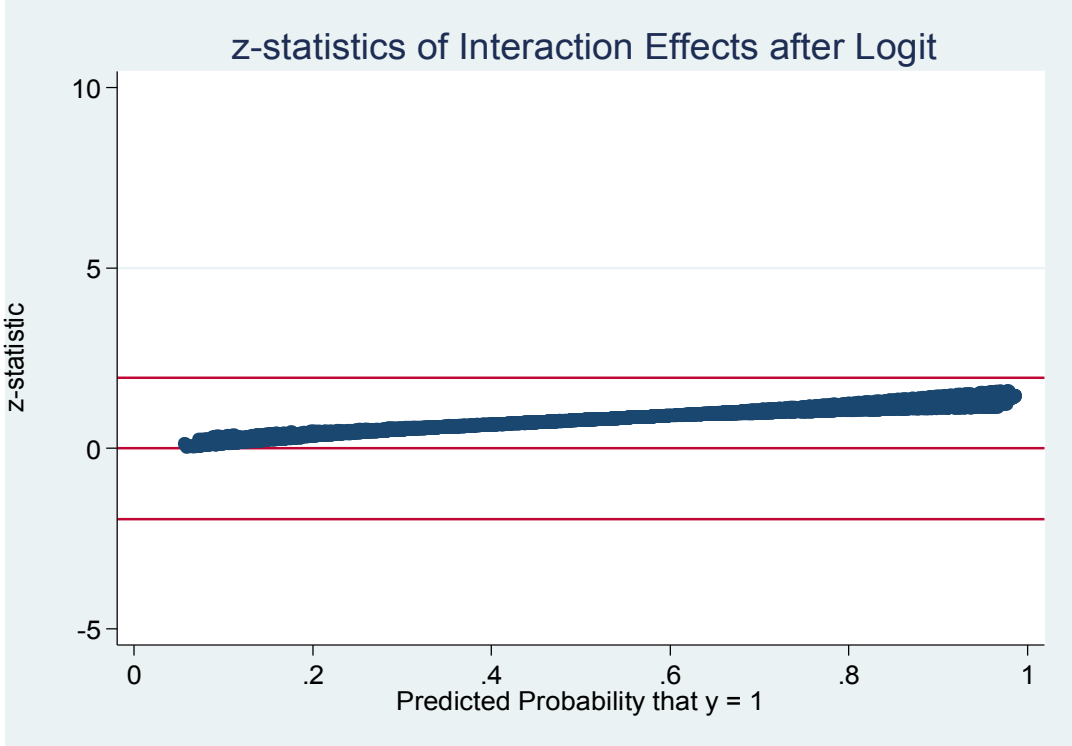


**Figure 3.4. Parameter of the Interaction Effect *Robin Hood_x_File Sharers* Depending on the Probability of Buy**

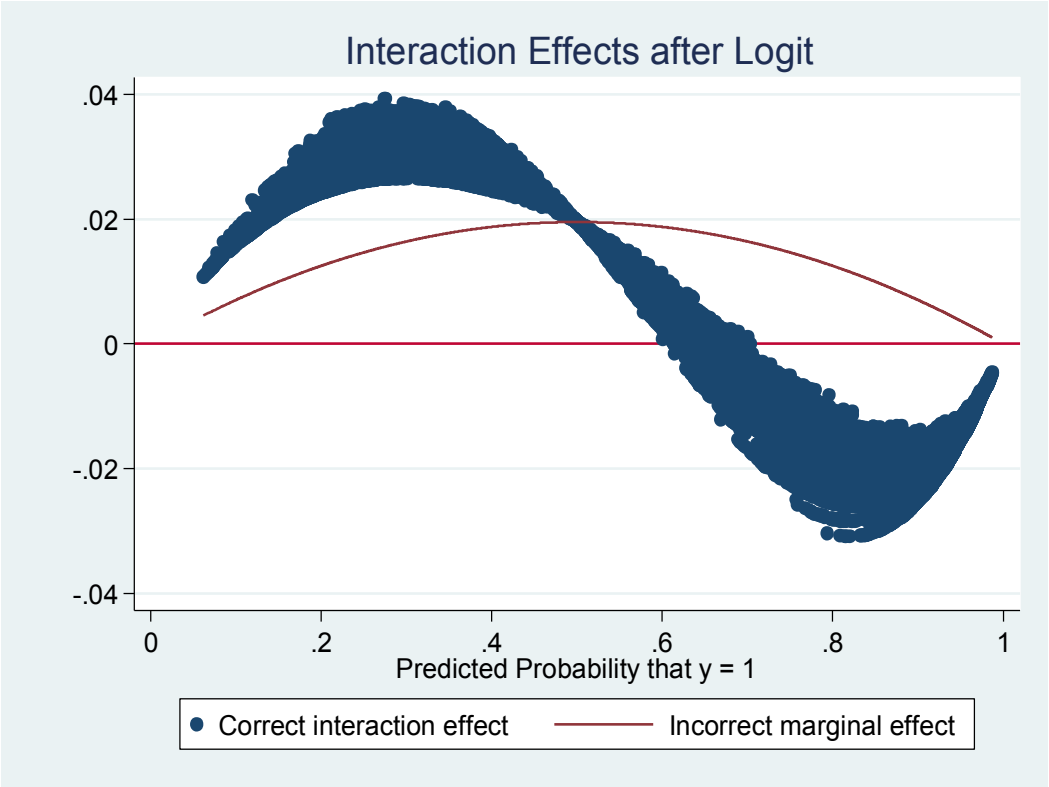



**Figure 3.5. Significance of the Interaction Effect *Robin Hood_x_File Sharers* Depending on the Probability of Buy**

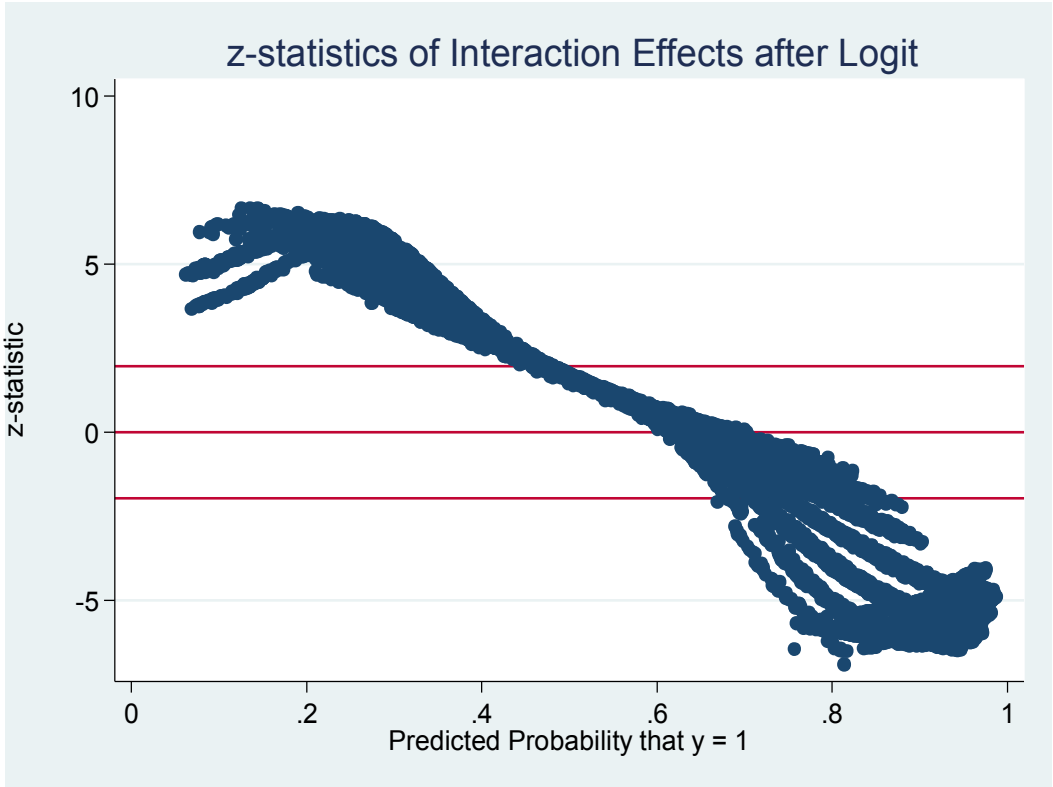


**Figure 3.6. Parameter of the Interaction Effect *Hours Listening_x_File Sharers* Depending on the Probability of Buy Digital**

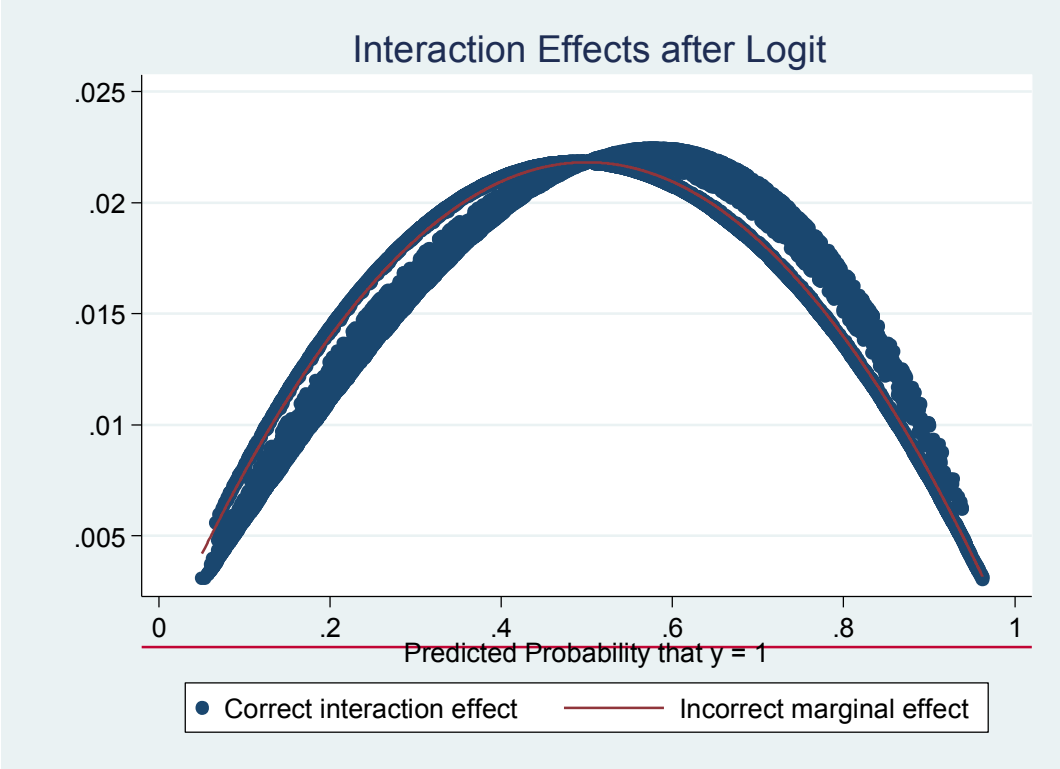



**Figure 3.7. Significance of the Interaction Effect *Hours Listening_x_File Sharers* Depending on the Probability of Buy Digital**

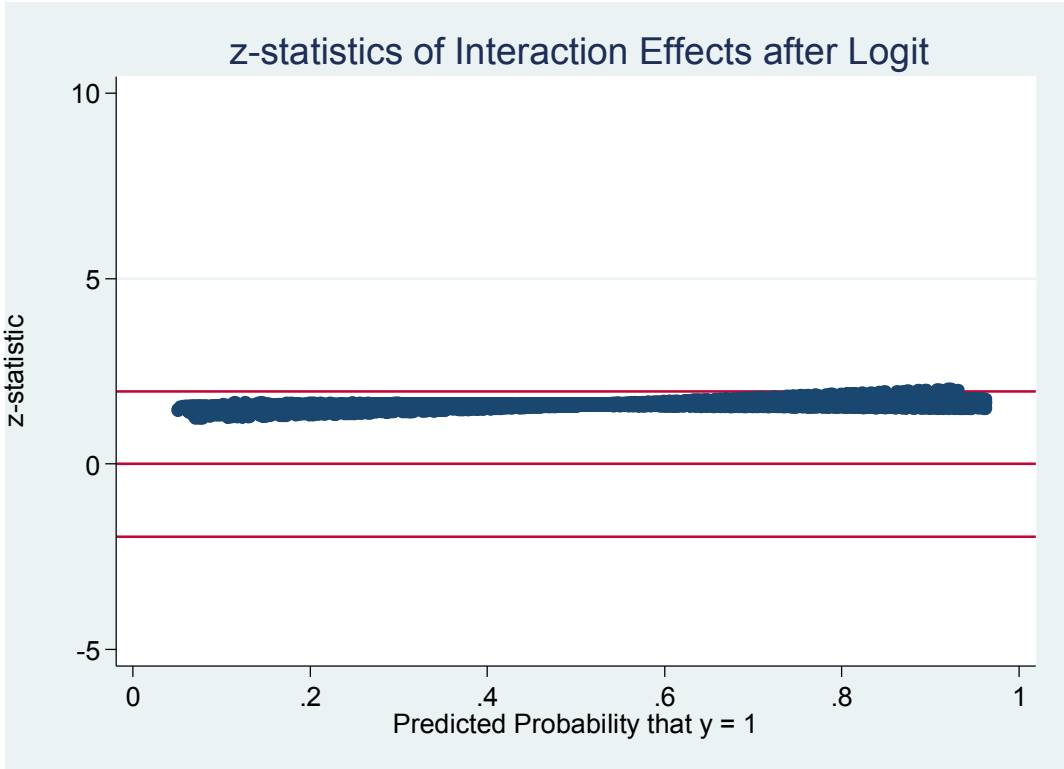


**Figure 3.8. Parameter of the Interaction Effect *Robin Hood_x_File Sharers* Depending on the Probability of Buy Digital**

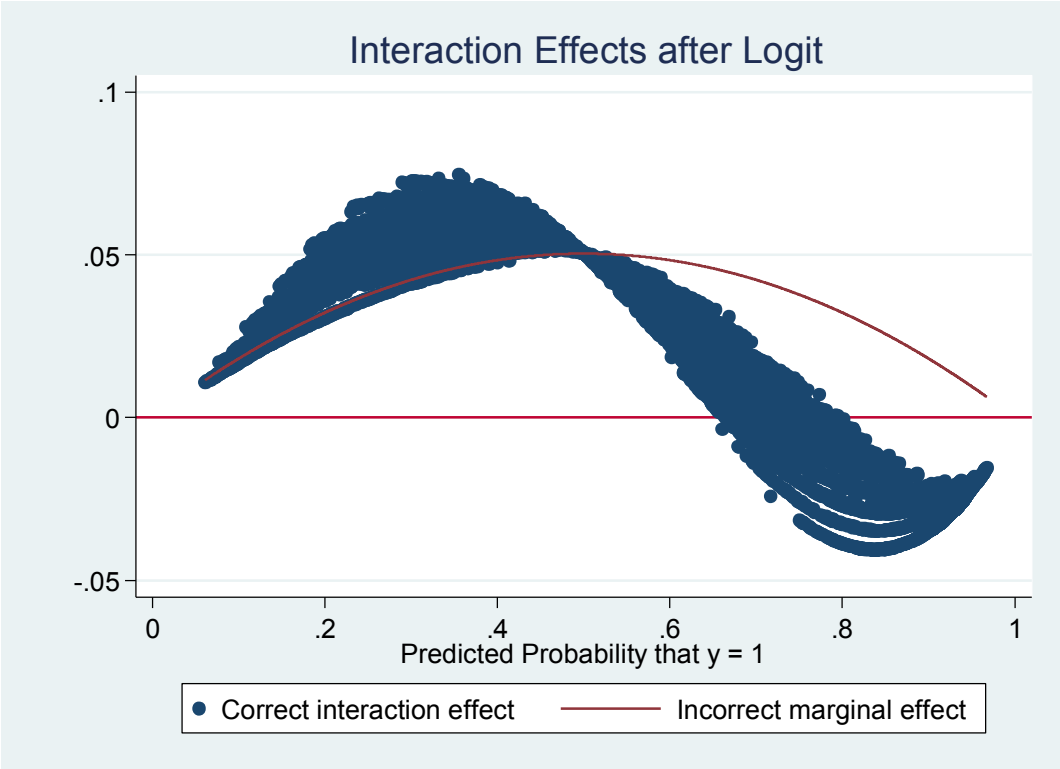



**Figure 3.9. Significance of the Interaction Effect *Robin Hood_x_File Sharers* Depending on the Probability of Buy Digital**

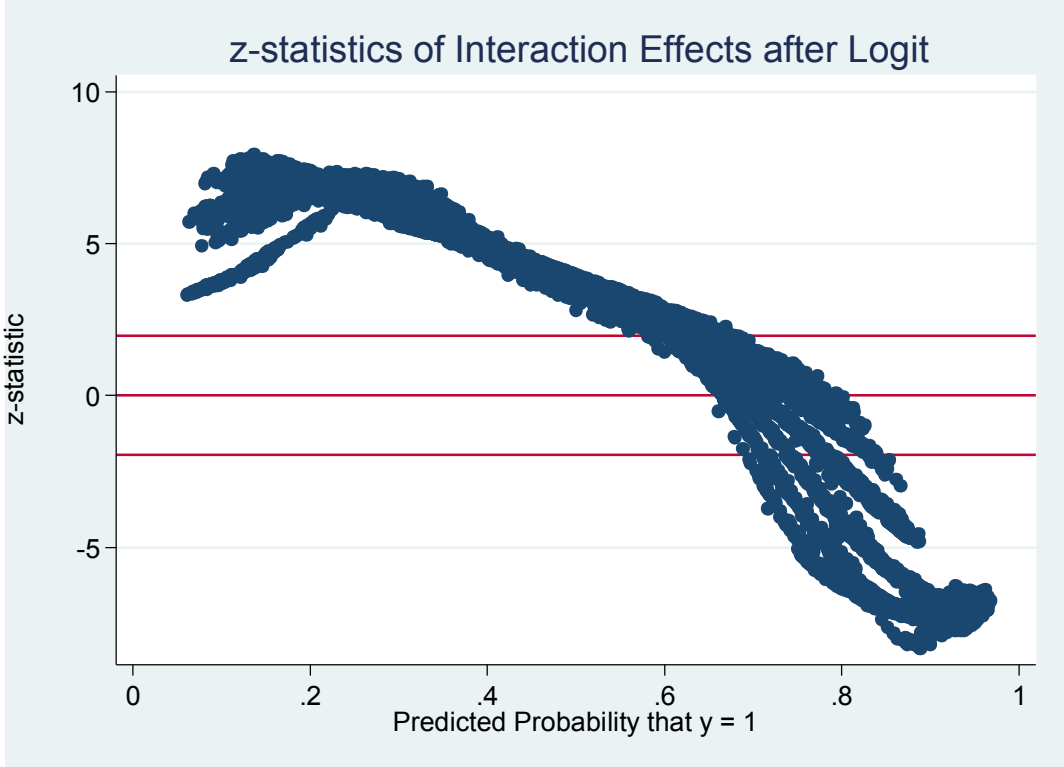


**Figure 3.10. Parameter of the Interaction Effect *Hours Listening_x_File Sharers* Depending on the Probability of Buy Physical**

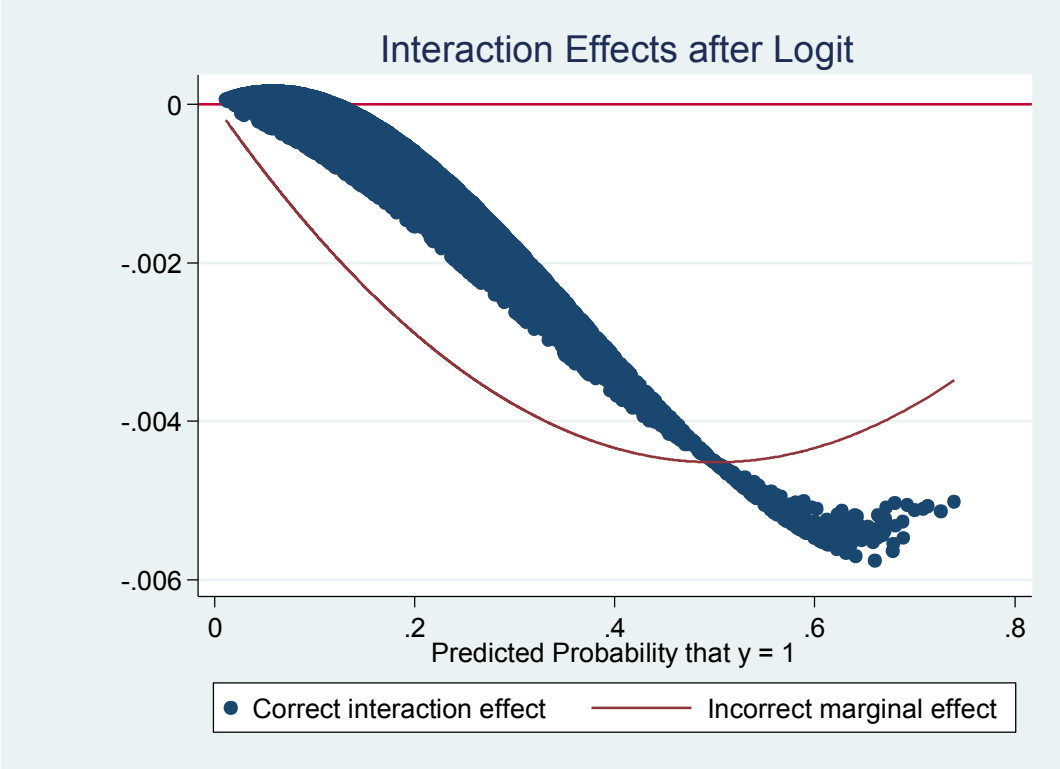



**Figure 3.11. Significance of the Interaction Effect *Hours Listening_x_File Sharers* Depending on the Probability of Buy Physical**

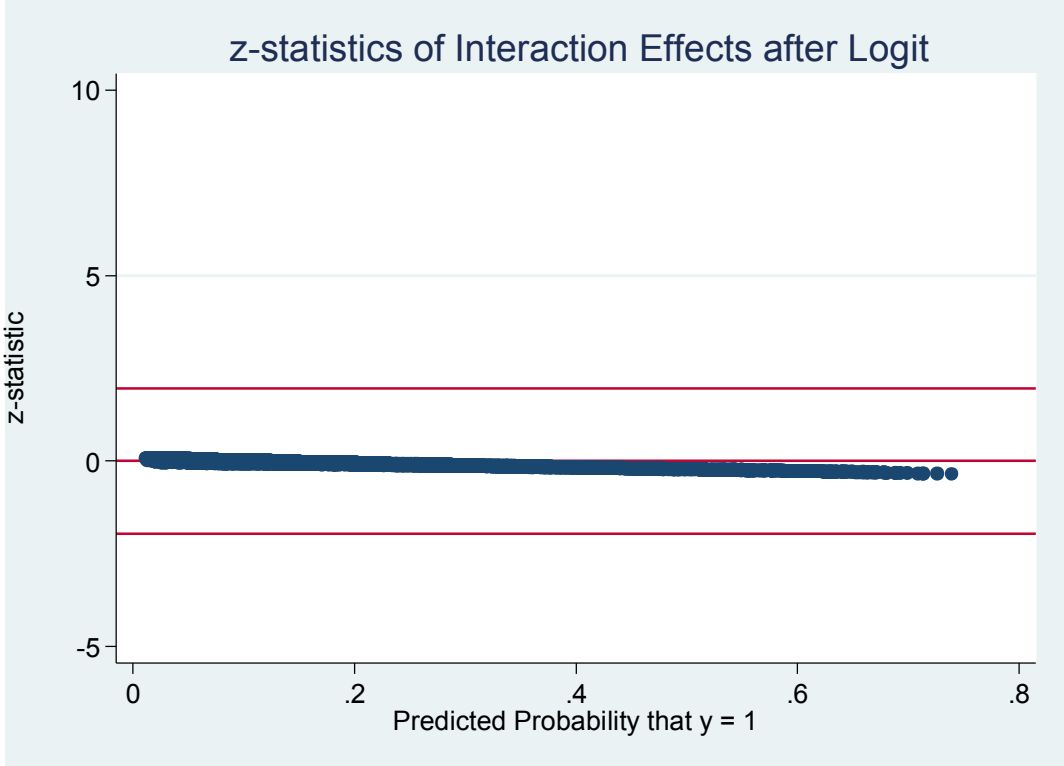


**Figure 3.12. Parameter of the Interaction Effect *Robin Hood_x_File Sharers* Depending on the Probability of Buy Physical**

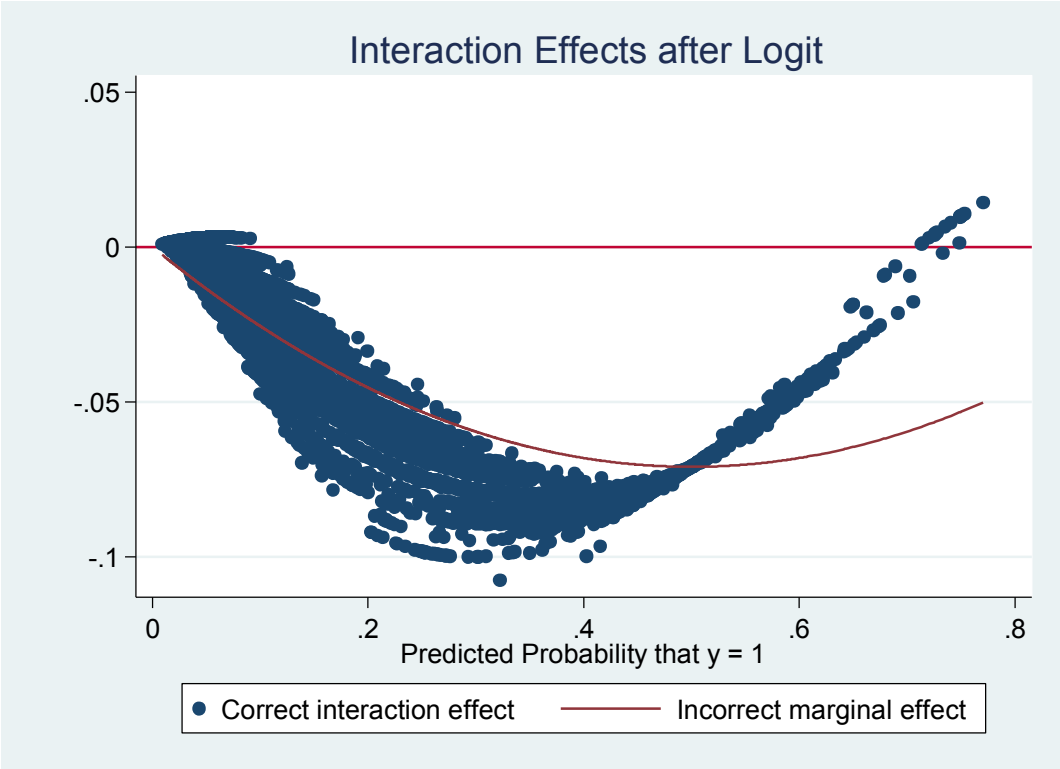



**Figure 3.13. Significance of the Interaction Effect *Robin Hood_x_File Sharers* Depending on the Probability of Buy Physical**

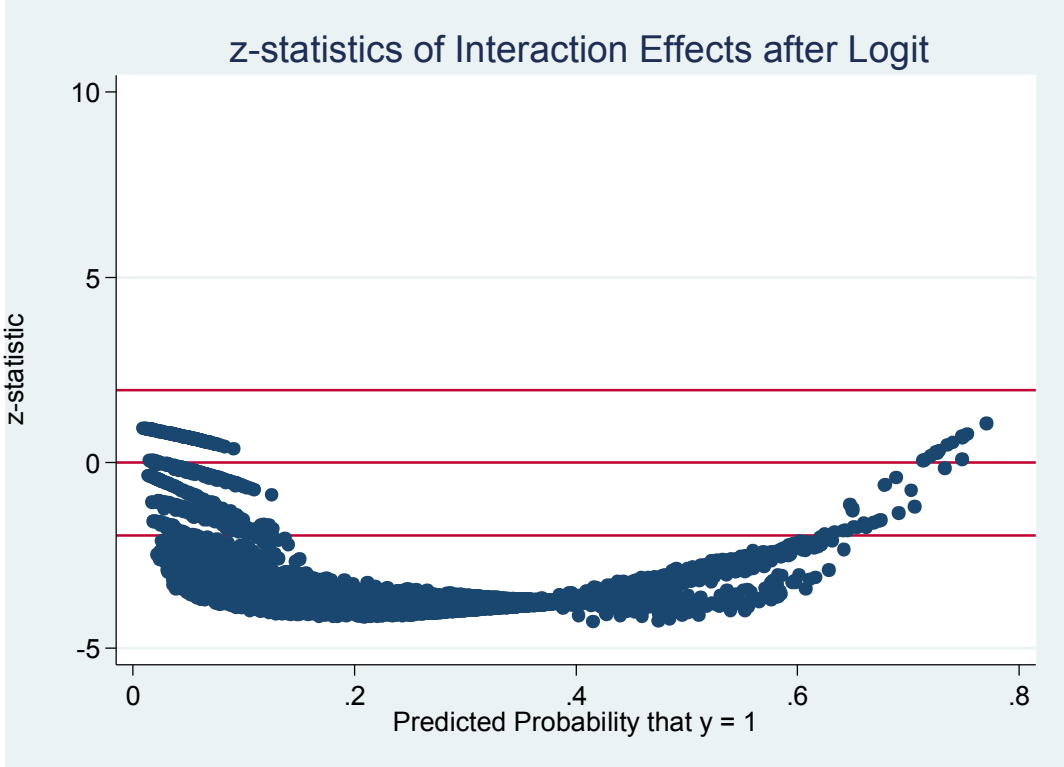


**Figure 3.14. Parameter of the Interaction Effect *Hours Listening_x_File Sharers* Depending on the Probability of Buy Both**

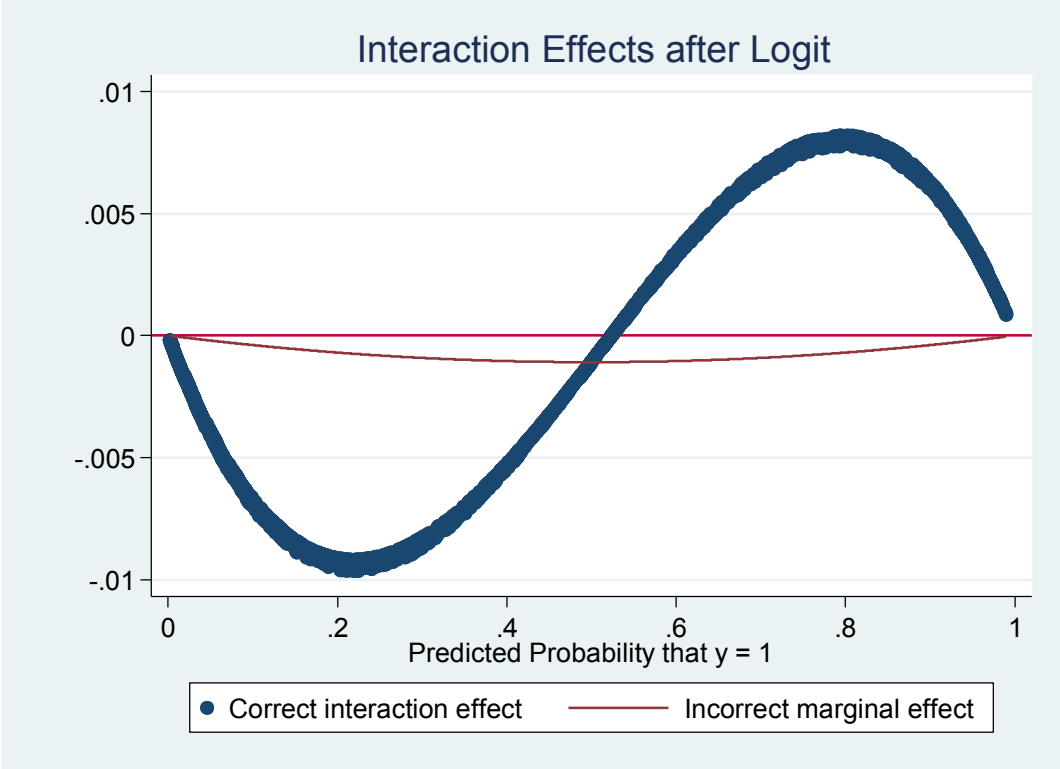



**Figure 3.15. Significance of the Interaction Effect *Hours Listening_x_File Sharers* Depending on the Probability of Buy Both**

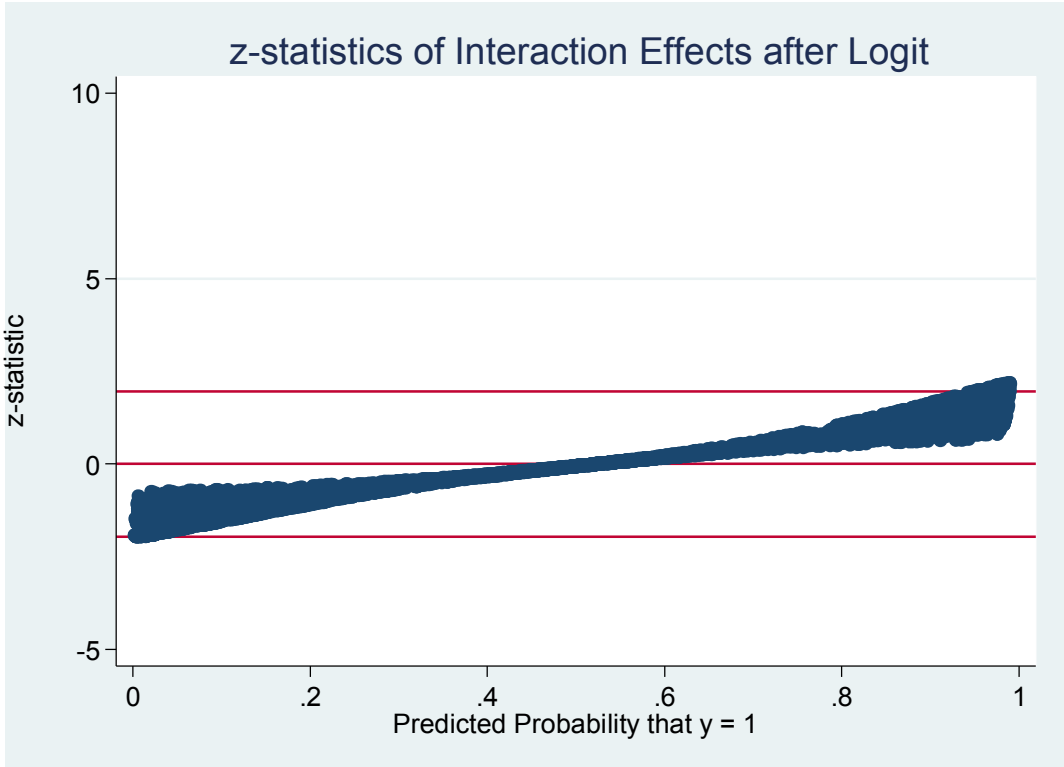


**Figure 3.16. Parameter of the Interaction Effect *Robin Hood_x_File Sharers* Depending on the Probability of Buy Both**

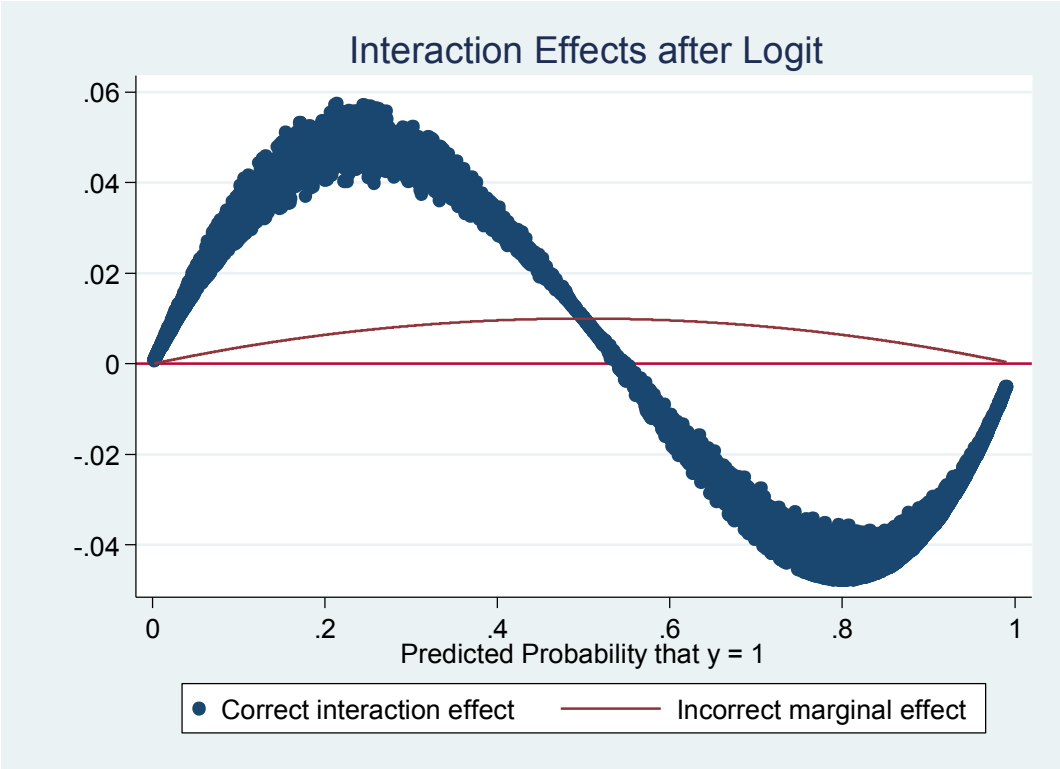
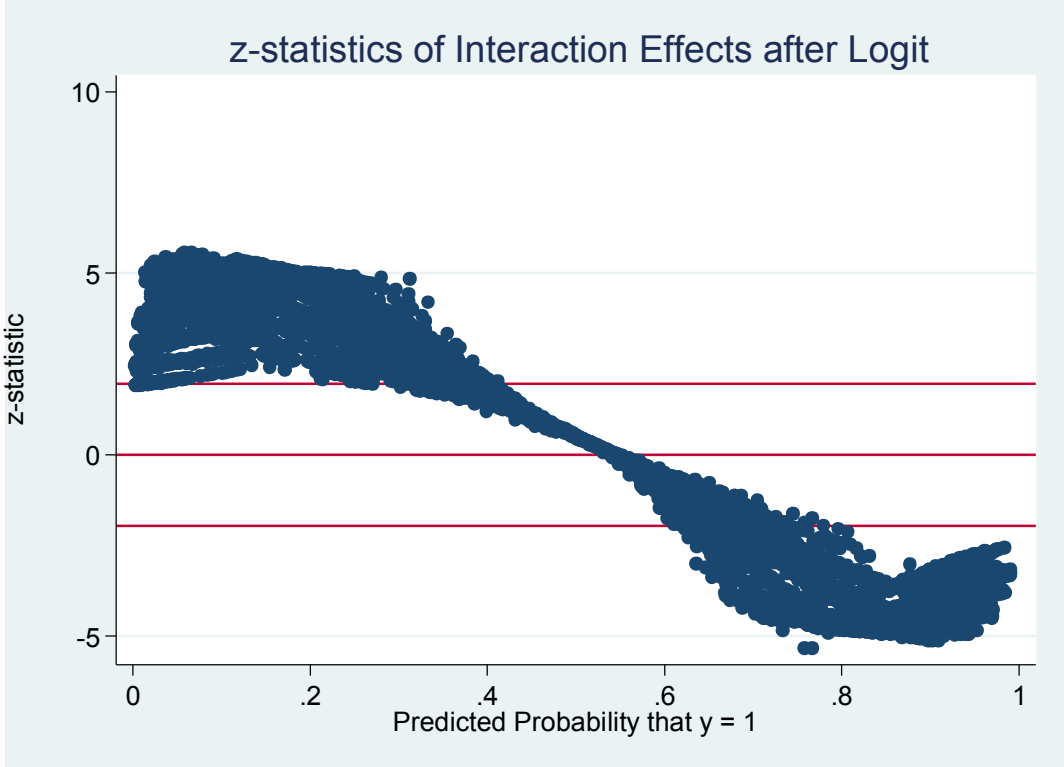



**Figure 3.17. Significance of the Interaction Effect *Robin Hood_x_File Sharers* Depending on the Probability of Buy Both**



## 3.5. EMPIRICAL RESULTS

### 3.5.1. EXCHANGE TRANSACTION COST AND PURCHASE SUBSTITUTION

Hypothesis 1 proposes that illegal file sharers will have a lower probability of purchasing music than non-file sharers, corroborated when parameter $\beta_1$ is negative. Tables 3.4, 3.5 and 3.7 show file sharers are less likely to purchase music than non-file sharers. This result is statistically significant at 1%. For example, the second column in Table 3.5 ceteris paribus shows file sharers are 7 percentage points less likely to purchase digital content than non-file sharers. Table 3.3 shows this result enables hypothesis 1 to be partially accepted, consistent with empirical literature reviewed. Confirming the findings of Andersen and Frenz (2010) a purchase substitution effect is rejected for the physical format market.

From a RBV perspective a plausible explanation is that the tangibility of the physical resource acts as a distinctive attribute or property right. A positive relationship is found between file sharers and the likelihood of purchasing music in physical form, statistically significant at 10%. Ceteris paribus file sharers are 1 percentage point more likely than non-file sharers to purchase music in physical form, see Table 3.6. It appears that file sharers separate digital and physical resource attributes related to property rights, giving the ownership attribute of a tangible resource a different and higher separate value to that afforded to digital resource. This result must be treated with caution and it should not be interpreted such that file sharers will buy significant physical volumes as, from Table 3.1, the probability of making a purchase of music in physical form in our sample is small, 19%.

### 3.5.2. CAPTURE TRANSACTION COST AND SAMPLE EXPOSURE

Consumers capture value from firms through exposure to their offering and their subsequent learning, sorting and selection of resource which they perceive as of most

value (Foss and Foss, 2005). Hypothesis 2a proposes that a positive relationship exists between exposure to music, measured in hours listened per week, and the likelihood of the general population buying music, implying $\beta_2$ is positive. Illegal file sharing acts an additional means of sample exposure so this relationship is expected to be stronger for file sharers, Hypothesis 2b, and hence $\beta_{12}$ may be also positive.

When compared to non-purchase, results show listening will increase general purchases (Table 3.4), physical purchases (Table 3.6) and both physical and digital purchases (Table 3.7). As an example for physical purchase, ceteris paribus an increase of 1% in the hours listened per week leads to an increase of 0.02 percentage points in the likelihood of an individual purchasing, Table 3.6. Hypothesis 2a is accepted in these three cases as this result is statistically significant, but not in the case of non-purchase vs. digital purchase where the effect is not significant, Table 3.5.

To accept hypothesis 2b, that illegal file sharers purchasing behavior is moderated by sample exposure, parameter $\beta_{12}$, derived from the interaction of the logarithm of hours per week and the dummy variable file sharing, should be positive. Following Ai and Norton (2003) this parameter is graphically interpreted, with results shown in Figures 3.2, 3.3, 3.6, 3.7, 3.10, 3.11, 3.14 and 3.15. The parameter becomes positive and significant (between 5 and 10% significance levels) only in Figures 3.6 and 3.7, the purchase of digital resource. Therefore, hypothesis 2b is accepted only in digital format. Examining Figure 3.7 it can be observed that when the predicted propensity to purchase (X-axis) is above 0.6 the significance (Y-axis) approaches 10%. Hence, illegal file sharers with an expected propensity to buy greater than 60% will increase their digital purchases as they are exposed to more music. An increase of 1% in the number of hours listening to per week implies an increase of 0.02 percentage points in the likelihood of making a digital purchase of a file sharer, Figure 3.6.

### 3.5.3. PROTECTION TRANSACTION COST AND CONSUMER RESPECT FOR PROPERTY RIGHTS

File sharers incur a psychological cost, a feeling of guilt, when downloading files illegally, the effect of which will be heterogeneous across the population (Henning-Thurau et al., 2007). The inverse measure of the individual respect for property rights is named the 'Robin Hood' tendency, Table 3.2. Table 3.4 shows that ceteris paribus an increment of 1% in the 'Robin Hood' tendency decreases an individual's likelihood of purchasing music by 0.18 percentage points. Hypothesis 3a is accepted as respect for property rights increases the likelihood of an individual purchasing. This result is consistent with the positive relationship between the perception of being caught and the willingness to pay shown by Sinha and Mandel (2008).

To analyze the effect of respect for property rights on those who file share (hypothesis 3b), following Ai and Norton (2003) the interactive term $\beta_{13}$ requires graphical analysis, which is presented in Figures 3.4, 3.5, 3.8, 3.9, 3.12, 3.13, 3.16 and 3.17. Taking Figures 3.4 and 3.5 as a reference $\beta_{13}$ is only negative when an individual has a probability of purchasing equal or larger to 60%. Hypothesis 3b is accepted for file sharers who have a probability of purchasing greater than 60%. As illegal file sharers respect for property rights increases, their propensity to purchase legally is increased in all formats.

*Other results*

Appendix 1 proves through the Hausman (1978) and Hausman and McFadden (1984) Independence of Irrelevant Alternatives (IIA) test that purchasing behavior significantly differs in digital and physical markets. The biggest purchasers in digital markets are characterized as wealthy young males whereas in physical markets they are characterized as wealthy and young consumers independent of gender.

Regarding country specific effects, Europe is the geographical area with greatest likelihood of purchasing as European consumers are 7 percentage points more likely to make a purchase than American consumers, see Table 3.4. This difference is significant at 1%. However, the European result is not homogeneous as Spain, France, Italy and Netherlands purchase less and illegally file share more than the remaining European countries considered in the analysis, a finding correlated to their legal origin[3]. In fact, Djankov et al., (2002) show countries with French legal origin have a tendency for corruption, which is consistent with these findings. Our results indicate that countries with a French legal origin show a 22% lower probability of purchase in comparison to those with English legal origin countries, Table 3.4. The result is statistically significant at the 1% level.

## 3.6. CONCLUSIONS

The focus of the RBV of the firm (Barney 1991; Peteraf 1993; Teece 1980) presents different firm performance as resulting from heterogeneity of resources (Wernerfelt, 1984). Costly to copy attributes of resources are the source of economic rents (Barney, 1986; Teece, 2007). Transaction cost economics (TCE) shows markets and firm are alternates as establishing a firm as vehicle to manage resource removes the cost of contracting (Coase 1937). The economics of property rights (EPR) proposes that resources are better defined by the attributes they offer as firms act to exploit the property rights of their resources under control (Barzel, 1997; Foss and Foss 2005). In the digital domain the copying and distribution attributes of a resource may readily be accessed illegally by the consumer at close to zero transaction cost. Transactions involve the exchange of property rights and costs are incurred in contracting for exchange or when consumers access resource without first gaining the right to do so

[3] See Bustinza et al. 2013

(Coase 1988). Capture costs relate to activities which appropriate value from others without compensation; and protection transaction costs are resource consuming activities undertaken to deter others from attempting to capture a firms property rights (Foss and Foss, 2005). The implication is that firms must manage property rights to optimize the use of resources and achieve sustainable returns over time (Rugman and Verbeke, 2002; Parry et al., 2010).

Property rights management links to informational problems in the economy, adverse selection and moral hazard, areas studied in the field of transaction costs (Allen, 1991). Disruptive innovations from the market, including MP3 and broadband Internet introduce transaction costs in the relationship between consumer and licensing firms (Christensen and Overdorf, 2000; Tidd, Bessant and Pavitt, 2011). Innovations provide consumers with the option of access to digital content without monetary exchange with the content owner, allowing consumers to capture value from creators. The purpose of this empirical work has been to clarify the likelihood of such behavior and the influences that exposure to the resource content and moral hazard has on the consumer. Consumers purchasing behavior is examined through logistic regressions of a large and unique dataset of more than 18,000 observations in 10 countries.

Hypothesis 1 links exchange transaction costs to the purchase substitution effect (Liebowitz 2006). This phenomenon occurs when consumers substitute legal purchases for illegally shared digital copies. The findings suggest that file sharers are significantly less likely to purchase music than non-file sharers, with the exception of purchases made in the physical format alone. Empirical results show file sharers are more likely to purchase music in physical form than non-file sharers, demonstrating a separation between the perceived value of physical and digital resource for this group, though the volume they buy is likely to be very small. This finding is consistent with a minority

set of empirical papers (Oberholzer and Strumpf, 2007; Andersen and Frenz, 2010; Gopal et al., 2006). File sharers give special value to specific attributes of physical goods, such as tangibility, which implies the existence of a premium effect. Through the Hausman (1978) and Hausman and McFadden (1984) IIA test the patterns that explain digital or physical consumption are shown to be significantly different. Given these findings it is suggested that industry differentiate physical and digital marketing in order to highlight physical attributes, particularly to those who illegally file share and value the tangible. For practitioners the finding suggests the promotion of the tangible resource in the digital domain may increase sales e.g. marketing luxury physical offering to those who access the content in the digital domain.

In this research capture transaction costs are linked to the sample exposure effect, where Hypothesis 2a states an individual exposed to a resource is more likely to purchase that resource (Liebowitz, 2006). Findings are broadly in agreement with previous evidence (Gopal et al., 2006; Andersen and Frenz, 2010; Chi, 2008). Hypothesis 2a is accepted for the cases of general purchase, the purchase of physical resource, and both physical and digital purchase, but not in the case of digital purchase alone as here the effect is not significant. Hypothesis 2b states the relationship between illegal file sharers and their likelihood of purchasing a resource is positively moderated by exposure to that resource and it is accepted only for digital purchases. Illegal file sharers with a propensity to purchase greater than 60% will increase their digital purchases as they are exposed to more content. The finding leads to the second implication for practitioners, that Freemium business models (Teece, 2010) such as streaming services (i.e. Spotify, youtube) may partially substitute illegal file sharing. Streaming has the advantage of separating the resource attribute of consumption from

the attributes of copying, storing and distribution that stimulate illegal behavior and are bundled with a downloaded file.

In this research it is assumed that protection transaction costs are linked to respect for property rights. Previous literature recognizes a psychological cost associated with illegally sharing files, but is silent on the empirical relationship between this cost and the likelihood to purchase (Henning-Thurau et al., 2007). Protection transaction costs depend on an individual's belief in property rights (Levi et al., 2009). Individual beliefs are modeled using factor analysis, creating a variable which is the inverse of respect for property rights and is named the Robin Hood tendency. Hypothesis 3a states that a respect for property rights increases the likelihood of making a purchase. This hypothesis is confirmed. Hypothesis 3b states that the relationship between illegal file sharers and their likelihood of purchasing resource is positively moderated by their respect for property rights, which is confirmed where the propensity to purchase is above 60%. A third practitioner implication is that industry needs to campaign to influence individual beliefs to increase the respect given to artists' property rights in addition to efforts to enforce IPR legislation.

In a robustness test[4] a correlation is found between individual beliefs (Robin Hood) and a countries institutional framework (legal origin). Countries with French legal origin contain a significantly higher proportion of people with a Robin Hood tendency than countries with German or English legal origin, which have a similar proportion between them. This reinforces the established idea that legal frameworks positively affect individual beliefs. Future empirical research will focus on estimating the effect of particular regulations on individual beliefs and behaviors, e.g. the Hadopi legislation in France (Danaher et al., 2012).

[4] Available upon request

Demand functions are estimated using logistic regressions, so the purchasing propensity is observed, not the volume purchased. Data does not provide individuals expenditure on resource. This is a limitation of the research since the actual economic impact is not estimated. Finally, hours listened per week is taken as the measurement for sample exposure. This is a novel and appropriate measure, assuming that the time to assess and learn about a resource is constant among the population. This is a limitation as there is no research which tests the required rate of sample exposure for a particular resource. Therefore, the variance in sample exposure effect is an issue which needs to be explored, potentially using theory such as absorptive capacity (Cohen and Levinthal, 1990) as it will contribute to understanding of Freemium models. The data set used in this research is from 2010. Going forwards analysis will be replicated as data becomes available for later years in order to observe if the sample exposure effect on the music consumers' groups' changes as more legal streaming services are made available.

## APPENDIX

### Appendix 1: Independence of Irrelevant Alternatives in music consumption

Music consumption can follow different paths depending on the format it is purchased in. If this is the case it is necessary to analyze different markets (i.e. digital or physical) independently. With the data available it is feasible to separate music purchase into four groups: non-buyers, buyers of only digital music, buyers of only physical music and buyers of both digital and physical formats. A Multinomial Logit analysis and its subsequent Independence of Irrelevant Alternatives (IIA) test is used to assess if the music consumption paths are different for each group. If this is not the case, the buying propensity can only be analyzed with the binary 'Buy' variable.

The Independence of Irrelevant Alternatives (IIA) assumes that characteristics of a chosen alternative do not impact the relative probabilities of choosing other alternatives. In the given context, if IIA is valid, the decision to purchase physical music or not is independent of the decision to purchase digital music. The test was devised by Hausman and McFadden (1984) as a variation of the Hausman (1978) test. It relies on the insight that:

i. If IIA is true the parameters of the choice between a subset of alternatives may be estimated with a multinomial logit model on both a subset or the full set, though the former is less efficient than the latter;
ii. If IIA is not true the calculated parameter estimates of the full set are inconsistent, whereas those of the subset are consistent provided that the subset is properly selected.

This test is implemented by a multinomial logit estimation and a post-evaluation of the difference in the parameter estimates. The results of the multinomial logit

analysis with the same set of variables of the baseline model in Table 3.5 are shown in Table 3.8 ('Not Buying' is the baseline group).

**Table 3.8**. **Multinomial Logit**

| Independent Variables | Buy Physical vs. Not a Buyer | Buy Digital vs. Not a Buyer | Buy Both vs. Not a Buyer |
|---|---|---|---|
| Gender | -0.04 | 0.14*** | 0.16*** |
| | (0.06) | (0.04) | (0.04) |
| Income Full-Time | 0.35*** | 0.17*** | 0.51*** |
| | (0.10) | (0.06) | (0.08) |
| Income Part-Time | 0.27** | 0.13* | 0.41*** |
| | (0.11) | (0.07) | (0.08) |
| Out of Job Market | 0.33*** | 0.08 | 0.38*** |
| | (0.12) | (0.07) | (0.09) |
| Students | 0.21 | 0.07 | 0.12 |
| | (0.13) | (0.08) | (0.10) |
| Ln(Age) | 0.14* | -0.23*** | 0.08 |
| | (0.08) | (0.05) | (0.06) |
| Passion for | 0.39*** | 0.32*** | 0.85*** |
| Technology | (0.06) | (0.04) | (0.05) |
| Passion for Music | 0.88*** | 0.21*** | 1.05*** |
| | (0.11) | (0.05) | (0.07) |
| Europe | 0.17 | 0.35*** | 0.71*** |
| | (0.13) | (0.07) | (0.08) |
| AusiAsia | -0.01 | 0.10 | 0.18** |
| | (0.12) | (0.07) | (0.08) |
| French LO | -0.25** | -1.11*** | -1.09*** |
| | (0.12) | (0.07) | (0.08) |
| German LO | -0.03 | 0.17** | 0.38*** |
| | (0.12) | (0.07) | (0.08) |
| File Sharers ($X_1$) | 0.17** | -0.33*** | -0.28*** |
| | (0.07) | (0.04) | (0.05) |
| Ln(Hours per week) | 0.18*** | 0.01 | 0.32*** |
| ($X_2$) | (0.04) | (0.02) | (0.03) |
| Robin Hood ($X_3$) | -0.76** | -0.94*** | -1.46*** |
| | (0.04) | (0.02) | (0.02) |
| cons | -2.84*** | 1.32*** | -2.24*** |
| | (0.35) | (0.21) | (0.25) |
| Log likelihood = -19,978.4 | | | |
| $X^2$ = 7,438.27 | | | |
| Number of obs = 18,842 | | | |
| Prob> $X^2$ = 0.00 | | | |
| Pseudo $R^2$=0.15 | | | |

Baseline group: Non buyers. Level of statistical significance: *** 1%, ** 5%, * 10%. Standard errors reported within parenthesis.

Descriptively it can be seen that the coefficients related to some of the independent variables are clearly different depending on the music format. For instance examining the file sharing coefficient, it is positive and statistically significant for physical consumption (0.17) and negative and statistically significant for digital and both formats consumption (-0.33 and -0.28, respectively). Another example is the coefficient of passion for technology for joint consumption (0.86) which is more that twice bigger than the coefficients for physical and digital consumption (0.39 and 0.33, respectively).

In Table 3.9 results for the IIA test for physical, digital and joint consumption alternatives are presented. The null hypothesis, that all the coefficients are equal between multinomial categories defined, is rejected. The conclusion is drawn that physical, digital and joint consumption may be analyzed separately.

**Table 3.9. Hausman Test**

| Hausman test | [BuyPhysical=BuyDigital] | [BuyPhysical=BuyBoth] | [Digital=Both] |
|---|---|---|---|
| chi2( 15) = | 487.51 | 848.88 | 1246.56 |
| Prob > chi2 = | 0.00 | 0.00 | 0.00 |

# CHAPTER 4

# 4. THE LINKAGE BETWEEN PRODUCT-SERVICE PORTFOLIO AND CUSTOMER VALUE: A COUNTRY LEVEL ANALYSIS

**ABSTRACT**

Manufacturing and creative industries are increasingly providing a number of different product-service offerings using the portfolio of resource, which creates a Product-Service System (PSS). We provide a novel empirical framework to evaluate PSS consumer demand at country level. We develop this framework for the particular case of the music industry and draw data from ten different countries. This research exploits a combination of real market sales data and extensive consumer survey data with more than 18,000 observations. The methodology used quantifies the discord between PSS offering and market opportunity in each country. The results demonstrate that in all the countries analyzed the relative consumer demand for intangible format was greater than that which was offered by the industry at the time of data collection. The results identify the different market opportunities which exist, in this case the opportunity to expand the digital offering. The US is identified as having a PSS which most closely matches consumer demand. Moreover, we report significant correlations between the level of PSS challenge and legal origin or technological infrastructure. This opens a debate with implications for both managers and policy makers.

## 4.1. INTRODUCTION

The Resource Based View suggests that resource bundles may be combined to create value propositions (Mills et al., 2003; Vargo and Lusch 2004, 2008). A firm may provide a number of different product-service offerings using the portfolio of resource, which creates a Product-Service System (PSS) (Neely 2008). Some companies face difficulties in achieving positive returns from PSS (Pezzottaet al., 2012) probably because PSS introduction requires an epistemological shift in the customer, from understanding the 'value in exchange' of product ownership business models to understanding 'value in use' created through access to resources in a service system (Macdonald et al. 2011). This requires a specific effort from the industry to understand the consumer perception of a PSS offering (Godsell et al., 2006; Cambra-Fierro and Polo-Redondo 2008). To the best of our knowledge, previous empirical evidence has not combined analysis of PSS portfolio offering with customer value perception or propensity to buy. This study contributes to theory by developing a novel methodology to establish the link between customer demand and the PSS portfolio offering across 10 different countries.

This study is based upon the case of the music industry, which has undergone a transition from gaining revenues from a primarily physical product offer to a much more diverse product-service offering (Parry et al., 2012). Previous literature on servitization and PSS analyses cases in which product and services are complements (Vandermerwe and Rada, 1988); this is not the case of the music industry which has particular academic interest due to the predatory nature of their offering –only very rarely will a consumer purchase the same content in different formats (Koukova et al., 2012). For the sake of simplicity the research presented in this study focuses on the dichotomy of tangible'product' (i.e. CD, Vinyl) and intangible 'service' (i.e. digital

downloads). These formats accounted for 70% of music industry sales in 2010 (see Figure 4.1). A unique music industry dataset comprising information for 10 countries in 2010 is used. The work exploits a combination of real market sales data from IFPI (i.e. sales per capita, sales growth, product-service sales portfolio) and data from 18,442 customer surveys provided by a major music licensing firm (for more details see chapter 1), which permits estimation of demand functions based on logistic regressions.

The objective of this study is to empirically analyse the existence of optimal resource bundles (product and service offerings) at industry level that maximize consumer value, in a context where PSS offerings are predatory and not complementary. The results suggest that in the case example the digital offering fell below potential market demand in all the countries analysed. On average consumers demand for music in intangible digital format was greater than what was sold. This mismatch between business offer and market demand can be considered a Business Model Challenge (Teece 2010), the scale of which can be quantified using the methodology outlined in this study. The evidence presented indicates that there is a negative and significant correlation between the degree of business model challenge and the access to digital technology of consumer in a market, both in terms of connectivity and hardware. The result is a call for policy makers to improve technological infrastructure and consumer access.

The next section presents the theoretical underpinning and present empirical research questions. Section 3 gives details on the database and methodology and Section 4 reports the results. Section 5 closes the work with discussion, limitations and guidelines for future research.

## 4.2. THEORETICAL UNDERPINNING

### 4.2.1. SERVITIZATION

Servitization was defined by Vandermerwe and Rada (1988) as an increment of the entire market packages of customer focused combinations of products, services and knowledge offered by a firm searching for additional value to their base product offerings. For Vandermerwe and Rada (1988) three reasons a firm may servitize are proposed: to prevent competitors from entering a market, to give additional value to preferred customers, and to gain differentiation. Based on the competitive advantage generic strategies established by Porter (1979), the concept of servitization is linked to the differentiation obtained by knowing the customer base requirement and entry barriers created through services which differentiate products. Whilst firms may servitize due to strategic rationale, literature also shows economic and environmental rationales for firms to go downstream and capture value from adding services (Wise and Baumgartner 1999).

This downstream movement enables new business opportunities for manufacturers based on the increase in consumer data volume and accessibility as well as methods to analyse such data (Neely 2008). New business models have appeared for manufacturers which unlock latent value from technology but forming a connection between technical potential and realization of economic value (Chesbrough and Rosenbloom 2002). The success of new business models reflects the extent to which firms understand what their customer want, define how the value proposition is delivered, how the customer is locked in and the way to capture value and thus make a profit (Teece 2010). Business models arising from the process of servitization develop the firm's innovation capabilities in creating value at the customer level by creating the correct balance of products and services (Visnjic and Van Looy 2013).

According to Baines et al. (2007) five different orientations to adoption of servitization are found in the literature: Servitization, Product Service Systems, Service Marketing, Service Operations, and Service Science. The differences between servitization and PSS are explained in next section. Services Operations literature establishes that services need to be managed using a different approach to that employed by those managing manufacturing operations (Chase and Garvin 1989; Gebauer et al., 2005). Service Marketing arose from Service Dominant Logic (SDL) (Vargo and Lusch 2004; 2008) analysing marketing strategies focused on value generation which consider customers as co-creators of value (Vargo and Lusch 2004; Parry et al. 2012). SD logic proposes a change in the underlying understanding of managers, from a logic based on tangible resources and value realised by the firm in the exchange of resource to a logic based on value realised by the customer when they utilise the provider offering (Lusch et al. 2007). Finally, Service Science moves to build a coherent framework to analyse the interactions of systems integrating business, technology and people (Chesbrough and Spohrer 2006; Fernandes 2012). Service Science attempts to analyse the role of business models, that includes a combination of product and services, as a base of future strategies for firms (Chesbrough and Rosenbloom 2002; Bustinza et al. 2013). However, in this work the focus is placed upon product service systems and servitization.

### 4.2.2. PRODUCT SERVICE SYSTEM

The Resource Based View (RBV) suggests that resource bundles may be combined to create value propositions (Mills et al. 2003; Vargo et al. 2008). Smith, et al. (2012) define service value propositions as multiple, simultaneous and iterative connections between provider and customer systems. In this regard, Product Service System (PSS) is a concept closely related to Servitization (Baines et al. 2007).

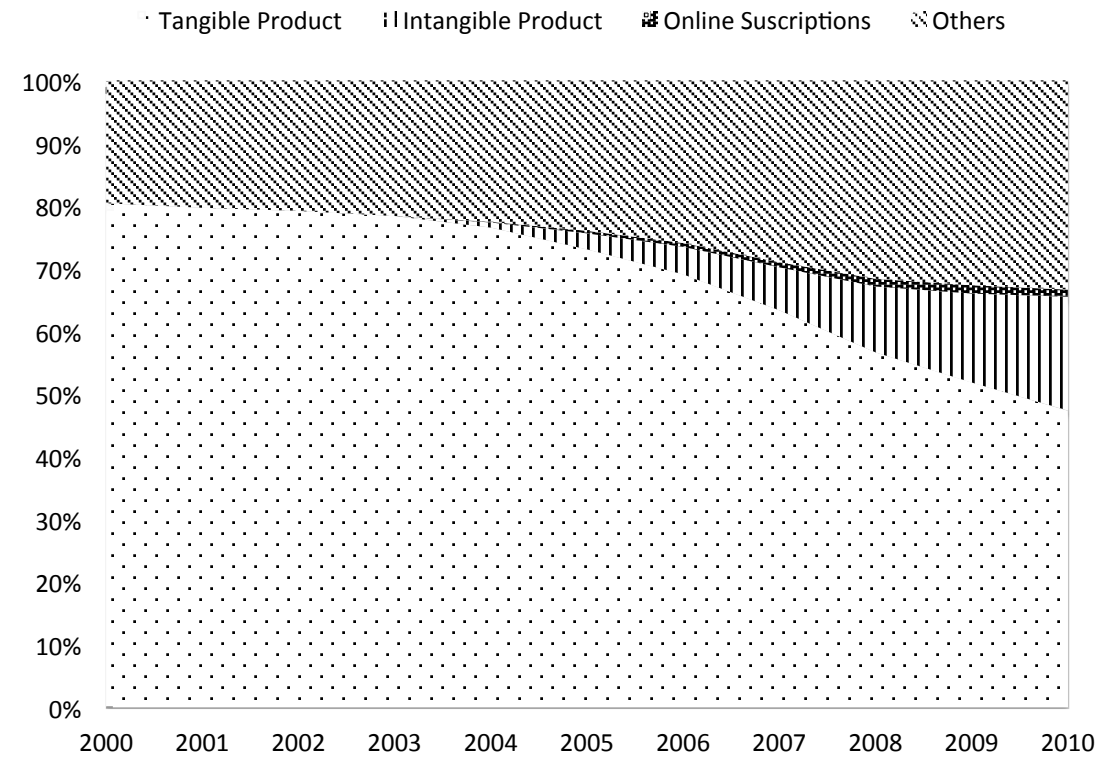
Servitization has been defined as product-based services while PSS is considered a specific product-service offering (Tukker 2004), therefore a PSS may be more focused on selling integrated solutions. Baines et al. (2007) defined PSS as a unified mix of products and services that deliver value in use. This is consistent with the paradigm shift for manufacturing firms to compete through value in use instead of cost (Porter et al. 2003). For these reasons, it can be understood that PSS consider service as fundamental to the value proposition (Gebauer et al. 2006) offering an essential difference with servitization in that the former is focussed in asset use rather than on asset ownership (Tukker 2004).

A classification of main and subcategories of PSS can be found in Tukker (2004) from pure product to pure service. Categorisation of PSS (Tukker 2004; Wilkinson, Dainty, and Neely 2009) has identified Product-Oriented, Use Oriented, Result Oriented, integration-oriented and service oriented PSS, which relate to the function of the business models of the firm. Analysing the level of interaction between customer-supplier, Martinez et al. (2010) establish the transition from a mainly transactional interaction through peripheral services to a close relational interaction between suppliers and customers based on product and service co-design.

In the transformation towards a PSS, firms have to face different challenges. Brax (2005) established six main challenges associated with the process of combing products and services as part of the strategy of a firm: Product-design, Production, Delivery, Marketing, Communication, and Relationship Challenges. Neely (2008) stated that one of the main challenges associated with PSS is the "business model and customer offering". This challenge is related to the lack of knowledge of how to design and deliver complex services and with an understanding of the organisational capabilities required to do so (Neely 2010).

The PSS co-ordinating firm may assume homogeneous customer capability in accessing the value of the PSS portfolio they offer, particularly when offering a spectrum of possible product and service regimes to customers (Ng et al. 2011). Ahamed et al. (2013) provide a detailed case study of how IBM Corporation successfully combined a physical product (i.e. hardware), a digital product (i.e. software, applications) and services (i.e. consulting, training). Their digital product and services increasingly provide the main source of IBM revenues, from marginal contribution in the early 90s, to 58% of the revenues in 2001, and 90% in 2011. This transition is also observed at industry the level. Parry et al. (2012) postulated that the PSS offer of the music industry can be catalogued under the headings "product" (physical product), "service - pay as you go" (digital product-service) and "service pay monthly" (service). Figure 4.1 shows the distribution of sales for these three offerings as well as other sources of revenues such as video, mobile and performance rights. It can be seen that in 2010 the majority of revenues are associated with physical-tangible product and digital-intangible product-service combinations. For this reason research presented here focuses only on this physical/digital dichotomy. At the theoretical level the terms intangible product and service will be used indistinctively hereafter.

**Figure 4.1. Evolution of Format Sales in the Countries Selected**




Source: IFPI. Online subscriptions include only online streaming. Others include the rest of formats such as mobile content, video, other physical formats different from CD or vinyl and especially performance rights.

By definition a PSS requires the coexistence of product and service but this coexistence can be complementary, as in the case of IBM, or predatory, when they are alternates and sales of product substitute for sales of service, as in the case of the music industry. In the complementary PSS scenario each customer chooses combinations of service offerings to complement their use of the product. In the predatory PSS scenario this does not happen, which suggests the provider must develop a different business model (Teece 2010). This is aided by capturing consumer information to develop an appropriate customer segmentation strategy (Jobber and Ellis-Chadwick 1995). Such a strategy is directly associated with the concept of value-in-use (Vargo and Lusch 2004; 2008) discussed in the next section.

### 4.2.3. CONSUMER PERCEPTION OF TANGIBLE AND INTANGIBLE GOODS

How does the consumer perceive the value of a product service system? From an economic perspective, the theory of consumer behaviour [5] explains how the consumer allocates income between goods and services. Due to assumed rational consumer behaviour money is utilized in order to get as much satisfaction as possible by maximizing utility, which depends on prices and income. At given prices in the economy the optimal allocation of income can differ between individuals due to their different preferences. The process of maximization of utility entails the consumer allocating income in such a way that the amount spent on each product provides the same marginal utility. Consequently, taking a purely economic perspective, there are three factors that determine the decision of the consumer: price, budget constraints and individual preference. Given this information the consumers' willingness to pay can be computed (Wertenbroch and Skiera 2002). Subtracting price from the value the consumer is willing to pay gives a value for an individual's consumer surplus.

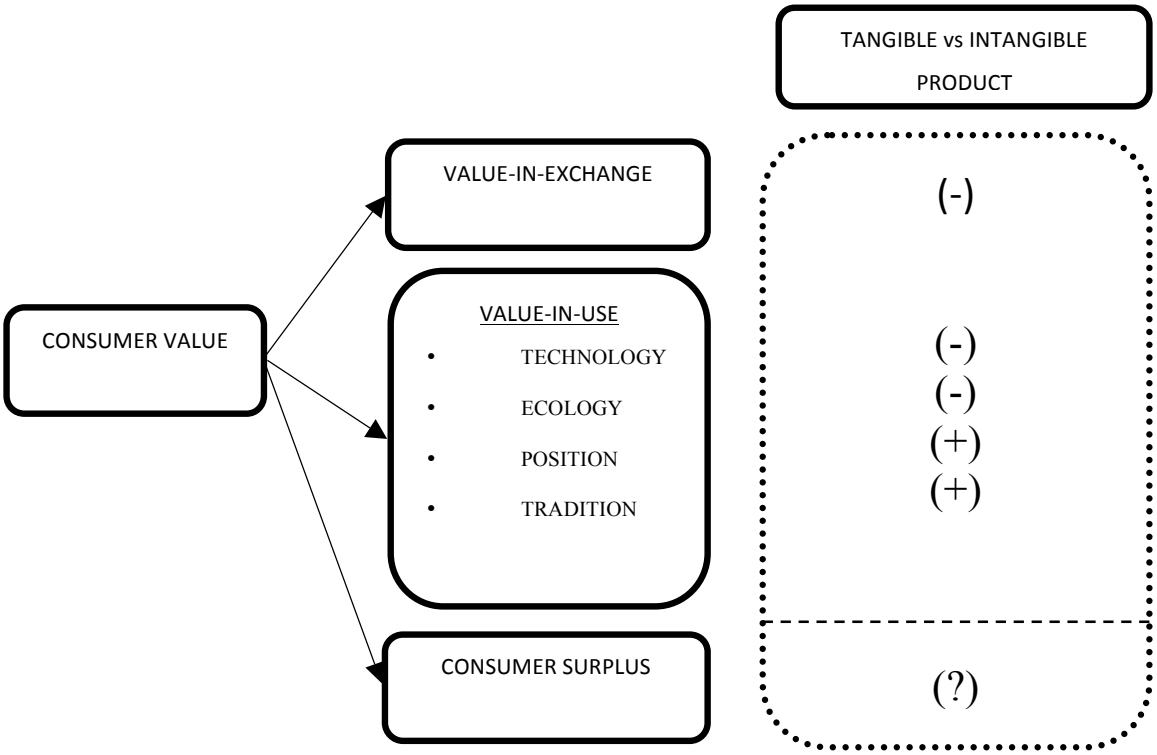
These concepts have their parallel in management literature. This stream of research seeks to estimate the individual value placed on a product or service depending on a consumer's characteristics (gender, status...) and beliefs. Zeithaml (1988) defines value as relating to the perception of the consumer based upon the difference between what they give and what they perceive they get. Value has many definitions and here we pragmatically adopt three different classifications of the term by Bowman and Ambrosini (2000). Value-in-use is the subjective evaluation of the consumer regarding specific characteristics of the product, so in economic terms this would be the consumer willingness to pay (Wertenbroch and Skiera 2002). Value-in-exchange refers to the price of the product, therefore the difference between the

[5] see Kreps 1990 for detail

perceived value-in-use and the exchange value equals the economic consumer surplus. Finally value creation represents the increase in use value realised by a consumer resulting from their interaction with the provider organization (Lado and Wilson 1994; Wright et al. 1994; Pfeffer 1995).

The present research is focused on the business to consumer (B2C) relationship where it is fundamental to understand how the consumer perceives the value of the bundle of products and services proposed by PSS companies in a market. The question raised here is how the consumer selects between the tangible and intangible offerings. Based on Bowman and Ambrosini (2000) we analyze the process through which the consumer compares the different PSS propositions, which in the context of the music industry is the tangible versus intangible offerings. Figure 4.2 graphically represents a composition of consumer value. The main components correspond to value-in-exchange and value-in-use. The price of music in digital format tends to be less than the price of music sold in physical format (Venkatesh and Chatterjee 2006), consequently based on the literature we propose that consumers may extract greater value-in-exchange from intangible format purchase. This debate becomes more complex when we deal with value-in-use, as it cannot be simplified into a single component, but instead we propose it may be catalogued into four main components: Technology, Ecology, Position, and Tradition.

**Figure 4.2**. **Tangible and Intangible Consumer Surplus Comparison**




(1) *Technology*: Digital data files are intangible and require technology for use. Those consumers that value connectivity, extensive availability, mobility and lower physical storage gain greater benefits from the intangible than the tangible formats (Lev 2001).

(2) *Ecology*: Consumers who are more sensitive to ecological issues (Webster Jr 1975) place greater value on offerings that consume least resource and are more environmentally sound. Intangible digital formats potentially provide greater value to these consumers.

(3) *Position*: According to Frank (1985) and Hirsch (2012) positional goods are those products or services whose value depends on how they are compared with things owned by others. Some important elements related to positional goods are status, luxury and uniqueness. Tangibility is not a necessary condition (i.e. luxury services like private health or Opera) for a positional good but often forms an important element.

Consumers giving importance to positional goods will likely gain greater value from tangible format music than intangible digital files.

(4) *Tradition*: Some consumers resist change and prefer to maintain their established methods of purchase regardless of the proposed benefit of new offers (Pritchard, Havitz and Howard 1999). Those consumers will give greater value to the incumbent formats, in this case tangible format music.

If consumer surplus is positive (negative) the consumer will prefer tangible (intangible) format. However, in this framework consumer surplus is as yet undetermined. The fact that three items (Price, Technology, and Ecology) give preference to intangible format and two items (position and tradition) to tangible format makes any prediction about the difference of consumer surplus between both formats impossible. This impossibility will hold even if other unobserved items employed in making the purchase decision are considered. A solution is a comparative analysis of consumer preference, which may be undertaken for different markets or countries.

### 4.2.4. PRODUCT SERVICE SYSTEM AND CONSUMER VALUE IN THE MUSIC INDUSTRY

The music industry is led by 3 major music-licensing firms who hold over 60% of the market share in terms of property rights to music resource (Informa Telecoms & Media 2010). The companies and their artists may influence the final combination of products and services, tangible and intangible formats, which are offered in each market using through distribution and promotion channels (Bockstedt, Kauffman, and Riggins 2005). Therefore, industry can define a business model offering in each market (Teece 2010), which results in distinct PSS. This is important because consumers have different value perceptions of the offering depending on the conditions shown in Figure 4.2. The success of the product service mix of the PSS forms the first research question:

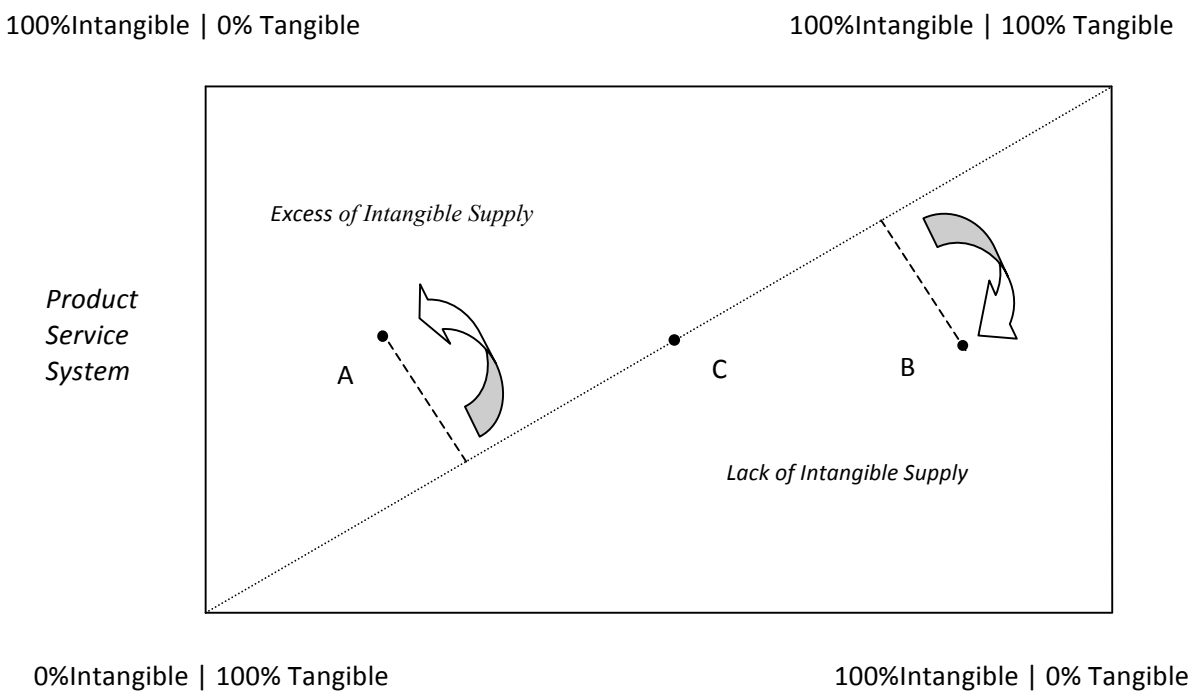
**RQ1:** Does the Product Service System maximize value-in-use for consumers?

In Figure 4.3 we graphically report the relationship between PSS, measured as the percentage of intangible format revenue, shown in the vertical axis, and the relative value-in-use of intangible format, shown in the horizontal axis. For simplicity this framework assumes that there are only two types of format available, tangible and intangible.

Market *A* in Figure 4.3 represents a context in which the industry offers a PSS with a relatively high number of intangible formats. Consumers in market *A* have greater preference for tangible format. The proportion of the population that receives a consumer surplus when purchasing tangible format is larger than the population receiving consumer surplus when purchasing intangible formats. Therefore, market *A* has an excess of intangible format offering and industry may correct for this through reducing the proportion of intangible offering or developing the tangible offering in the PSS. In contrast the average value-in-use of the consumers in market *B* is higher for intangible formats, but the PSS of the industry has prioritised tangible offerings. The industry has a deficit of intangible format offerings, and opportunity to develop the digital offer in market *B*. Finally, market *C* represents a situation in which product service system is perfectly equilibrated with consumer value-in-use. This leads to the second research question.

**RQ2:** What is the business model challenge faced in markets where the PSS is not in equilibrium with consumer demand? Is there an excess or lack of service offering?

**Figure 4.3**. **A Two-Dimension Framework for Identifying Business Model Challenge**




Finally in the case that there is a business model challenge analysis asks if industry faces limitations or barriers to the implementation of the PSS which best satisfies consumers. As an example firms may face barriers to commercialization of digital offerings in countries whose technological infrastructure is unable to support large quantities of data transfer (Dettki 2003).

**RQ3:** Are business model challenges the result of endogenous variables amenable to management intervention or variables which are exogenous to the PSS providers control?

## 4.3. DATA AND METHODOLOGY

The music industry represents an industry where revenues were in sharp decline between 1999 and 2012 (Parry et al. 2012). A unique music industry dataset comprising

information for 10 countries in 2010 was collected. The countries selected cover different geographical locations and legal systems (Djankov et al. 2002). In particular information from two independent sources is given for US, Canada, Australia, Japan, UK, Germany, France, Italy, Netherlands, and Spain. First, supply side information (vertical axis in Figure 4.3) comes from market aggregated data, containing details of the sales of the different music formats available in 2010. This information was provided by the industry trade body, the International Federation of the Phonographic Industry (IFPI). Second, consumer data (horizontal axis in Figure 4.2) from extensive surveys was collected by one of the 'Big 3' global music companies providing information on individuals characteristics, beliefs, file sharing activity and music consumption patterns. With survey data it is possible to analyze the behavioural motivations and estimate the purchasing propensity of the consumers for different formats. The consumer survey data contains 18,842 observations[6].

The information of format sales permits the construction of a measure of the distribution of sales for tangible and intangible formats. Tangible formats considered are CD and Vinyl, which provide music via a physical support. *Tangible sales per capita* is measured as the sum of sales of CD and Vinyl over total population, and *Percentage of tangible sales* is measured as the sum of sales of CD and Vinyl over total sales. Intangible formats are defined as commercialized music provided without a physical support; in the years studied these are digital downloads in the form of singles and albums (i.e. iTunes). *Intangible sales per capita* is measured as the sum of sales for digital albums and digital tracks over total population and *Percentage of intangible sales* is measured as the sum of sales of digital albums and digital tracks over total sales. There are other possible sales formats (e.g. mobile, video, streaming) which are

[6] For a detailed sample description see chapter 1.

not considered in the current analysis and hence the sum of *Percentage of tangible sales* and *Percentage of intangible sales* is smaller or equal to 1.

The information at country level is complemented with information on technological infrastructure provided by the IMD World Competitiveness Centre. In particular the connectivity index (it ranges from 0 to 10, in which 10 means that the country is felt to have extensive connectivity between people and firms enabled by its infrastructure) and computers per capita (computers per 1,000 inhabitants).

The probability of purchase at country level may be estimated by taking the people from each country that claim to purchase music in either, tangible or intangible format. However, this methodology would not control for sample selection bias (the composition of the samples could be heterogeneous in terms of age, gender, working status or taste for music). To solve this problem we estimate consumer likelihood to purchase music ($p_i$) through discrete choice models. Theoretically, a given consumer has a probability to buy music $y_i^*$, linearly related to a vector of observable variables, $x_i$ and non-observable factors collected in the error term, $\varepsilon_i$:

$$Y_i^* = \beta x_i + \varepsilon_i \qquad (4.1)$$

When $y_i$* is greater than 0 the consumer decides to buy music. A consumer's propensity to buy music cannot be observed, only their actual choice, which is called $y_i$ and gives a value of 1 when the consumer buys and 0 otherwise. The nature of survey data makes it preferable to use Logit models with maximum likelihood estimator (Horowitz and Savin 2001). Moreover, the logit models can be derived from utility maximization and predicted probabilities have a simple closed form expression (McFadden 1973, 1980).[7] Empirically the probability that $y_i=1$ is given by equation

[7] One individual in our sample could decide to either purchase music in tangible format ($\mu_j = \mu_1$) or not purchase ($\mu_j = \mu_2$), and his/her utility is associated with each of the alternatives presented $U_j = \mu_j + \varepsilon_j$, $j=1$ and $2$, where $\mu_j$ is a non-stochastic function of the explanatory variables and unknown parameters and $\varepsilon_i$ is an unobservable random variable, which for sake of precision could be assumed to have a log Weibull distribution. Then the predicted probability of our individual to purchase music in tangible form $p_i(Y_i = 1|x_i)$ is $e^{\mu 1}$ divided by $e^{\mu 1} + e^{\mu 2}$.

4.2, where $\beta$ is the vector of coefficients to be estimated and the individual lineal predicted probabilities are given by the formula $p_i = F(x_i'*\beta)$, where $F$ is the cumulative logistic distribution.

$$p_i = P(y_i = 1|x_i) = \frac{\exp(x_i'\beta)}{1+\exp(x_i'\beta)} \quad (4.2)$$

This methodology allows us to obtain an estimate of an individual's predicted probability of purchasing, which can be aggregated at country level. This predicted probability is used for other empirical purposes, for example the horizontal axis in the graphical representation of the interactive parameters developed by Ai and Norton (2003)[8].

In empirical terms, we differentiate our dependent variable, $y_i$, between the likelihood to purchase music in tangible and intangible format. These form the binary dependent variables.

- *Buy tangible* takes value 1 if the consumer claims to buy music in physical format (i.e. CD) and 0 otherwise.
- Similarly, *Buy intangible* takes value 1 if the consumer claims to purchase music files from digital stores (i.e. iTunes) and 0 otherwise. The vector of observable variables, $x_i$, is composed of customer specific characteristics (gender, age, and working status), consumption behaviour (willingness to pay, budget constraint, file sharing behaviour, and hours listened per week), and country specific effects (Legal origin and continent).

Table 4.1 gives information for the average and dispersion of the variables and details of how they have been constructed.

[8] See Figure 2.2.2 to Figure 2.2.17 as an illustration.

**Table 4.1. Descriptive Statistics**

| | Variable construct | Obs. | Mean (St. Deviation) |
|---|---|---|---|
| **Supply side*** | | | |
| Sales per capita Tangible | (Sales CD + Sales Vinyl) / Total Population | 10 | 9.02 (4.43) |
| Sales per capita Intangible | (Sales digital and album tracks) / Total Population | 10 | 2.12 (1.80) |
| Percentage of Tangible Sales | (Sales CD + Sales Vinyl) / Total Sales | 10 | 0.60 (0.07) |
| Percentage of Intangible sales | (Sales digital and album tracks) / Total Sales | 10 | 0.14 (0.11) |
| **Technological** Infrastructure** | | | |
| Connectivity | Connectivity of people and firms executive survey based on an index from 0 to 10 at a country level for the year 2010 | 10 | 7.97 (0.85) |
| Computer per capita | Number of computers per 1,000 people for the year 2010 | 10 | 764.98 (129.81) |
| **Demand side** *** | | | |
| Buy Tangible | Buyers of CD and/or Vinyl | 11529 | 0.52 (0.49) |
| Buy Intangible | Buyers of digital files and/or albums | 17550 | 0.68 (0.46) |
| Gender | Dummy variable ( 1 for male and 0 for female) | 18842 | 0.53 (0.50) |
| Age | Consumer`s age with a range 15-99 | 18842 | 36.10 (15.10) |
| Income Full-Time | | 18842 | 0.37 (0.48) |
| Income Part-Time | Consumer's answer to the question: | 18842 | 0.21(0.41) |
| Out of Job Market | *What is your working status/ occupation?* | 18842 | 0.16 (0.36) |
| Students | | 18842 | 0.08 (0.27) |
| Willingness to Pay | Dummy Variables for consumers who are willing to pay for music | 18842 | 0.51 (0.49) |
| Budget Constraint | Dummy variable for consumers that the lack of money is the main reason they don't buy music | 18842 | 0.49 (0.49) |
| File Sharers | Dummy variable for consumers who download digital music they didn't pay for | 18842 | 0.28 (0.45) |
| Hours per week | Hours of listening to music the consumer has chosen/bought per week | 18842 | 3.30 (3.40) |
| Passion for Technology | Dummy variable for consumers who love technology, and music is a big part of that technology | 18842 | 0.53 (0.50) |
| Passion for Music | Dummy variable for consumers that music is important in their life | 18842 | 0.85 (0.36) |
| America | Dummy variable for American consumers | 18842 | 0.24 (0.43) |
| Europe | Dummy variable for European consumers | 18842 | 0.55 (0.50) |
| AusiAsia | Dummy variable for Australian or Asiatic consumers | 18842 | 0.20 (0.40) |
| French LO | Dummy variable for consumers from countries with French legal origin system | 18842 | 0.37 (0.48) |
| English LO | Dummy variable for consumers from countries with English legal origin system | 18842 | 0.46 (0.50) |
| German LO | Dummy variable for consumers from countries with German legal origin system | 18842 | 0.16 (0.37) |

**Source:* IFPI
** *Source:* IMD WORLD COMPETITIVENESS ONLINE 2010
*** *Source:* One of the 'Big 3' global music companies. See Bustinza et al. (2013) for precise description. This research uses 1,702 less observations in respect to Bustinza et al. (2013) due to missing data. Continuous variables (Age and hours per week) are presented here in normal form but in the regression model are introduced in logarithms for normalizing the parameters.

## 4.4. RESULTS

The first stage in the empirical design is to analyze consumer preference through logistic regressions. Table 4.2 reports the results of two logistic regressions. Column 1 analyzes the propensity to purchase in tangible format against not purchasing and the explanatory variables explain approximately 21% of the variance of the dependent variable. Column 2 analyzes the propensity to purchase in intangible format, a model with an explanatory capacity of approximately 16%. The independent variables are presented in Table 4.1; some are related with the factors described in Figure 4.2 that influence the value in use. Consistent with previous literature (Zentner 2006; Liebowitz 2008; Bustinza et al. 2013), file sharers exhibit a lower probability of purchasing music in tangible or intangible format, providing evidence of the purchase substitution phenomenon (Liebowitz and Watt 2006). Ceteris paribus, file sharers have 19.8% (20.9%) lower probability of purchasing intangible (tangible) formats than non-file sharers. These results are statistically significant at 1%. Those consumers that exhibit a positive willingness to pay for music are more likely to purchase in both formats. Ceteris paribus, those consumers that claim to be willing to pay for music have 18.6% (28.9%) greater probability of purchasing music in intangible (tangible) format than those consumers not willing to pay for music. These results are statistically significant at 1%. This probability decreases significantly when the individual who expresses a willingness to pay faces budget constraints. In a test, not reported in tables here, we reproduced the analysis for the subsample of consumers that are willing to pay for music. We observe that, ceteris paribus, those consumers claiming to be willing to pay for music but are budget constrained have only 13.3% (=18.6% − 5.3%) greater probability of purchasing music in intangible formats than those consumers not willing to pay for music. In the case of the tangible format, those individuals claiming to be

willing to pay for music but with budget constraints (13.3%) have only 21.2% (=28.9% − 7.7%) greater probability of purchasing than those consumers not willing to pay for music. These results are statistically significant at 1%. Overall, the parameters are similar with the exception of gender. While there is no significant difference in the propensity to purchase in tangible format between males and females, males are, ceteris paribus, 1.7% more likely to purchase music in intangible format than females. This result is significant at 1%.

As explained in the methodology section, the model permits an estimate of the average propensity to purchase in tangible and intangible format for each consumer and consequently we can aggregate these probabilities at country level. To ensure that probabilities are consistent with consumer expenditure at country level methodological tests are undertaken, see Figures 4.4 and 4.5. The horizontal axis in the figures represents aggregate predicted probabilities, while the vertical axis represents the average expenditure per capita in each of the formats. Assuming that a null propensity to purchase must be related to zero expenditure we find that consumer demand and level of expenditure are correlated in both cases, making our predictions more credible and robust. This result is statistically significant at 1%.

Having established these results we can address the research questions by empirically replicating the situation of the music industry reported in Figure 4.3. At this stage information is available at the country level for the Product Service System (*Percentage of Tangible Sales,* $S_T$, and *Percentage of Intangible Sales*, $S_I$) and consumer perception (average estimated propensity of purchasing music in Tangible, $P_T$, and intangible format, $P_I$). As mentioned before, $S_T + S_I < 1$, and by construction $0 < P_T + P_I < 2$. In order to reproduce an empirical version of Figure 4.3 we need first to normalize the percentages to 1. Consequently, we have:

$$S_{TN}(=S_T/(S_T+S_I)) + S_{IN}(=S_I/(S_T+S_I)) = 1 \quad (4.3)$$

$$\text{and } P_{TN}(=P_T/(P_T+P_I)) + P_{IN}(=P_I/(P_T+P_I)) = 1 \quad (4.4)$$

**Table 4.2. The Propensity to Purchase in Tangible and Intangible Form through Logistic Regression**

| | Independent Variables | Tangible Buyer vs. Non Buyer | Intangible Buyer vs. Non Buyer |
|---|---|---|---|
| Variables related to Value-In-Use reported in Figure 2.3.2 | Passion for Technology | 0.751*** | 0.520*** |
| | | (0.046) | (0.039) |
| | File Sharers | -0.849*** | -0.928*** |
| | | (0.049) | (0.041) |
| | Willingness to Pay | 1.197*** | 0.942*** |
| | | (0.044) | (0.037) |
| | Budget Constraint | -0.205*** | -0.221*** |
| | | (0.044) | (0.037) |
| | Income Full-Time | 0.439*** | 0.237*** |
| | | (0.073) | (0.060) |
| | Income Part-Time | 0.342*** | 0.171*** |
| | | (0.079) | (0.065) |
| | Out of Job Market | 0.397*** | 0.174*** |
| | | (0.083) | (0.067) |
| | Students | 0.137 | 0.035 |
| | | (0.093) | (0.075) |
| Taste for Music | Passion for Music | 1.034*** | 0.487*** |
| | | (0.070) | (0.050) |
| | Ln(Hours per week) | 0.299*** | 0.155*** |
| | | (0.028) | (0.024) |
| Personal Characteristics | Gender | -0.004 | 0.088** |
| | | (0.044) | (0.037) |
| | Ln(Age) | 0.330*** | 0.110** |
| | | (0.056) | (0.047) |
| Country Specific Characteristics | Europe | 0.854*** | 0.650*** |
| | | (0.084) | (0.072) |
| | AusiAsia | 0.107 | 0.110* |
| | | (0.076) | (0.065) |
| | French LO | -1.569*** | -1.679*** |
| | | (0.078) | (0.067) |
| | German LO | -0.320*** | -0.205*** |
| | | (0.081) | (0.067) |
| | Cons | -2.933*** | -0.279 |
| | | (0.236) | (0.189) |
| | Log likelihood | -6,303.3694 | -9,125.4158 |
| | $X^2$ | 3350.08 | 3561.31 |
| | Number of obs. | 11529 | 17550 |
| | Prob> $X^2$ | 0.0000 | 0.0000 |
| | Pseudo $R^2$ | 0.2099 | 0.1633 |

Standard Errors in Parenthesis. Level of statistical significance: ***, ** and * denote statistically significance of 1%, 5% and 10% respectively. Reference groups are unemployed.

**Figure 4.4. Correlation Analysis between Average Propensity to Purchase and Average Expenditure in Intangible Format**

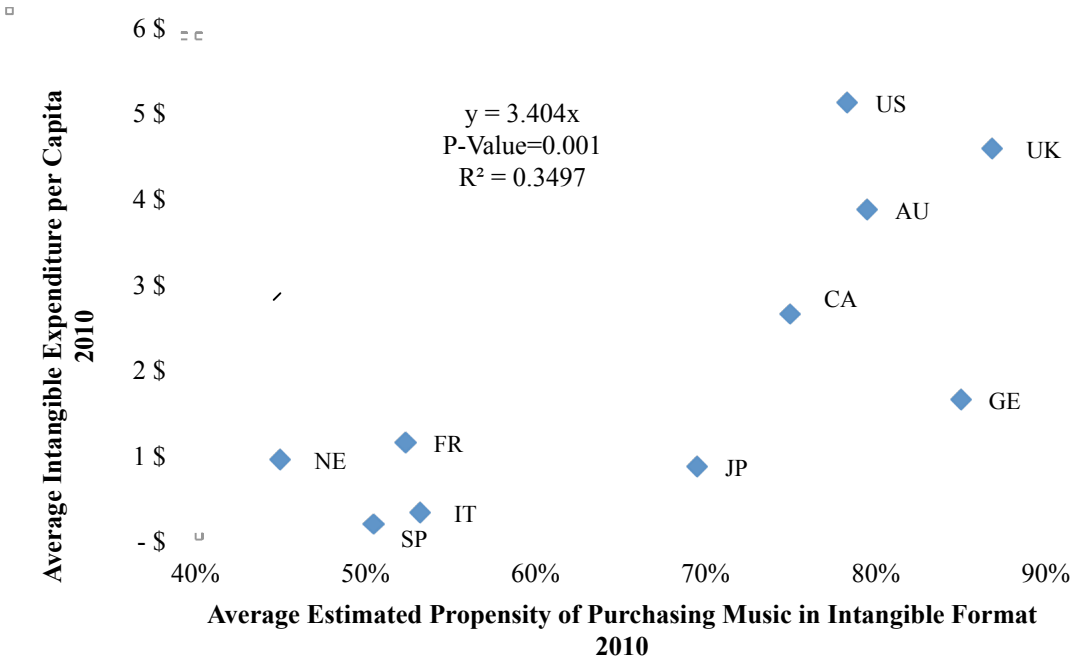



**Figure 4.5. Correlation Analysis between Average Propensity to Purchase and Average Expenditure in Tangible Format**

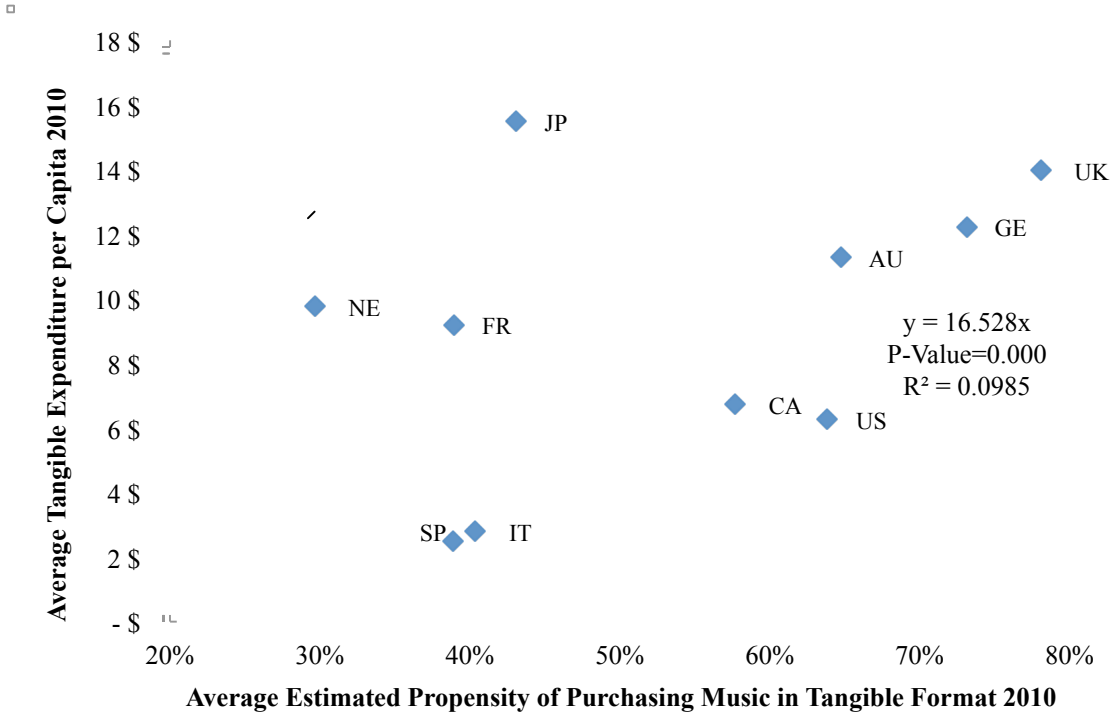
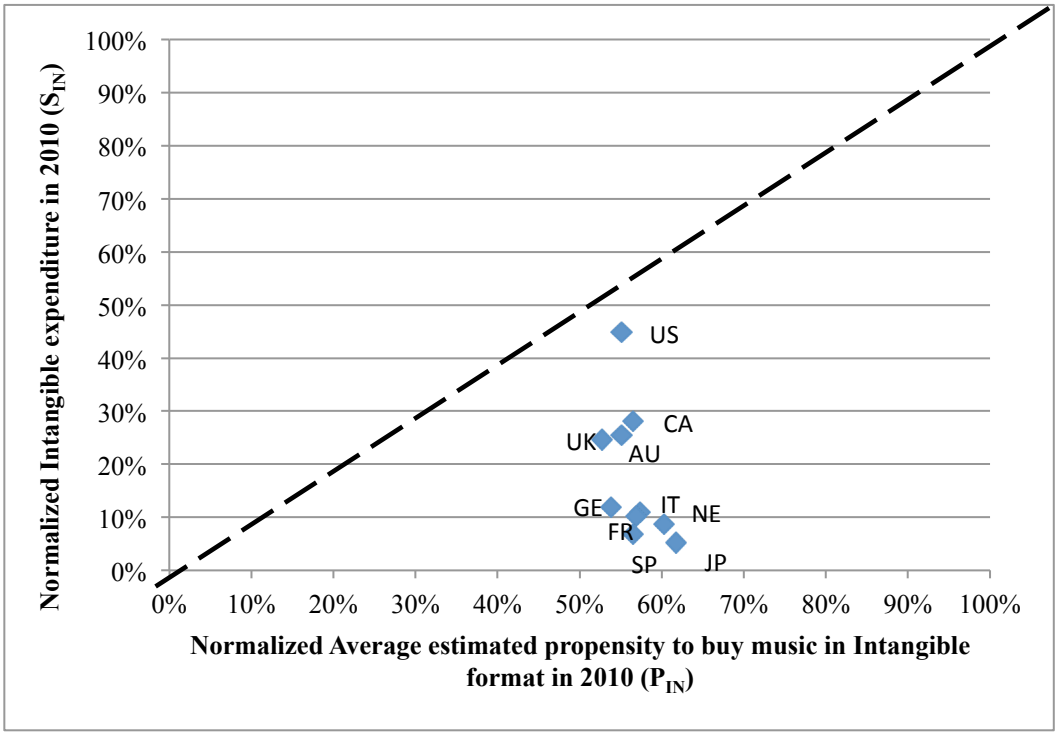


Figure 4.6 graphically represents the parameters $S_{IN}$ (vertical axis) and $P_{IN}$ (horizontal axis), reproducing a complete empirical picture of Figure 4.3, with parameters normalized.

**Figure 4.6. Normalized Value-in-Use and Normalized Intangible Music Offering**




The first research question asks whether the PSS maximizes value-in-use for consumers. As can be seen in Figure 4.6 value is not maximized in any of the markets analyzed as the consumers' propensity to purchase is unsatisfied as the observations are not on the 45 degrees line. This answers the second research question, which asks whether it is an excess or lack of intangible format offering, markets *A* and *B* in Figure 4.3 respectively. According to the representation in Figure 4.6 all countries analyzed lack intangible format offerings, suggesting that the industry needs to redefine their PSS, enhancing the digital offering. The desire for increased intangible formats is relatively consistent among countries ($P_{IN}$ ranges from 52.6% in UK to 61.7% in Japan) while the PSS offering has a huge heterogeneity ($S_{IN}$ ranges from 5.2% in Japan to 44.9% in US) suggesting the existence of an important Business model challenge, at

least in some countries. From Figure 4.6 it can be seen that those countries with English as a first language and an English Legal origin [UK, Canada, Australia and UK] appear to more closely meet their consumer needs than other countries.

The third research question pursues understanding of the barriers to implementation of the optimal PSS. In order to achieve this objective we need to quantify the business model challenge. The business model challenge is quantified as the distance of the point defined by the *Normalized Value-in-use ($P_{TN}$)* and *Normalized Intangible Music Offering ($S_{IN}$)* from the line $P_{TN}=S_{IN}$ in the 2-dimensionsional axis $(P_{TN},X_{TN})$. According to Eucledian geometry the distance between a point $(P_{TN0},X_{TN0})$ and a line give by the equation $a \cdot P_{TN} + b \cdot S_{TN} + c = 0$ is the shortest distance between the point and the line calculated by the formula:

$$Distance\big(a \cdot P_{TN} + b \cdot S_{TN} + c = 0, (P_{TN0}, X_{TN0})\big) = \frac{|a \cdot P_{TN0} + b \cdot P_{TN0} + c|}{\sqrt{a^2 + b^2}}$$

Therefore in this case we calculate the business model challenge for each country using the formula: $\text{Distance}\left(P_{TN}\text{-}S_{TN} = 0, (P_{TN0}, X_{TN0})\right) = \frac{|P_{TN0},X_{TN0}|}{\sqrt{2}}$

In Figure 4.7 and 4.8 we correlate the distance, or degree of business model challenge, with connectivity index and number of computers per capita. The first variable measures the capacity that individuals and firms have in order to connect themselves to the internet. This is important when commercializing music in intangible format which is purchased online. The second variable measures the hardware infrastructure as consumers need computers in order to realize the benefits of the intangible format. Figures 4.7 and 4.8 show that the correlation is negative in both cases (statistically significant at 10% in the case of computers per capita), indicating that technological barriers exist to the implementation of optimal business models. The

results show technological infrastructure is a crucial requirement if a firm is to achieve a combined and satisfactory PSS, which a larger proportion of intangible sales.

**Figure 4.7. Correlation between Connectivity and Business Model Challenge**

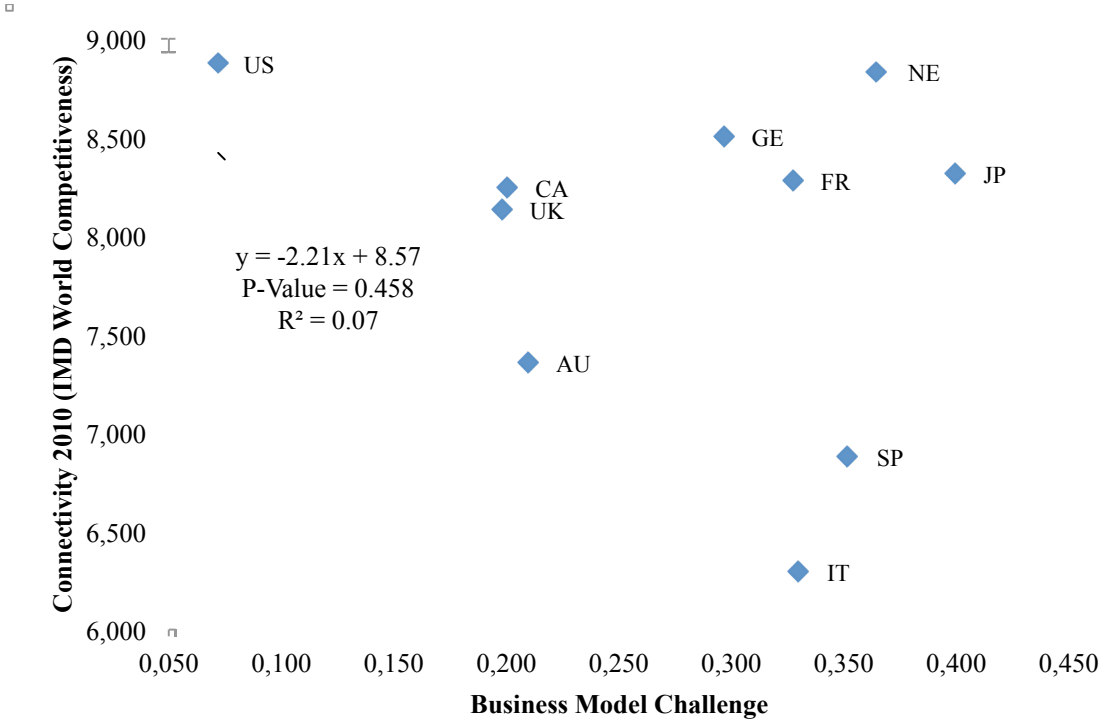
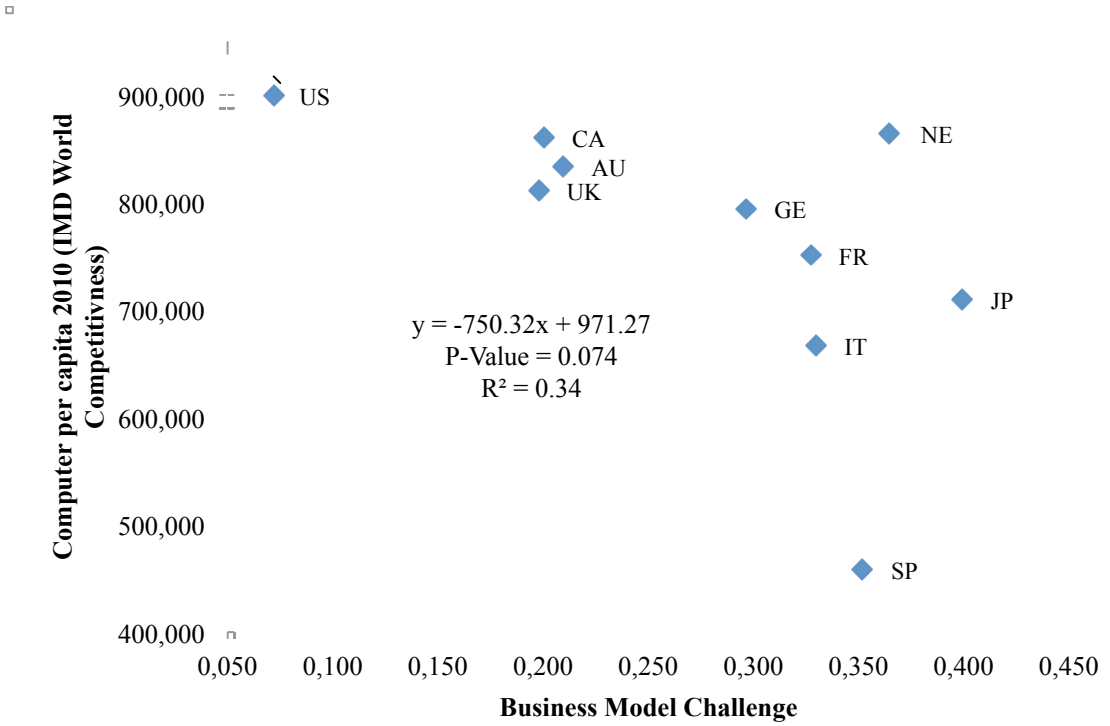



**Figure 4.8. Correlation between Computers per Capita and Business Model Challenge**



## 4.5. CONCLUSIONS

New business models based on servitization (Vandermerwe and Rada 1988) require a shift in subjective consumer valuation (Bowman and Ambrosini 2000). Therefore, the dynamics of product service systems and consumer value-in-use cannot be analyzed separately. This is the main theoretical contribution of this chapter. As described in Figure 4.3 we propose a novel empirical methodology to analyse and identify the optimal balance of product and service in a PSS based on a two-dimensional model which includes relevant information from both supply and demand side perspectives. Focusing on a demand-based perspective (Godsell et al. 2006; Cambra-Fierro and Polo-Redondo 2008) our model suggests that the optimal PSS will be the one that maximizes consumer value, or in economic terms, consumer surplus. In this situation the combination of product-service offered will equal the proportion of product-service demanded.

This empirical method will be of particular interest for those industries with decreasing revenues and PSS where products and services are predatory, acting as substitutes for each other. The music industry fits this situation and is used as a basis for analysis here. The revenues in the music industry have decreased significantly in the last 15 years (IFPI 2011; Parry et al. 2012) and a multitude of different substitute formats have been introduced. For the sake of modeling simplicity and given they are the dominant formats during the period of the source data (See Figure 4.1) research was based on the tangible (CD and Vinyl) and intangible (digital albums and tracks) dichotomy.

The results provided are valuable for practitioners. The methodology provides evidence, shown in Figure 4.6, which supports the view that the industry needs to increase the relative support given to offering providing the intangible format.

Proposed changes in the balance of offering in the PSS can suffer from barriers, such as technological ones, when digital services are introduced. This is the case in Spain which has only 50% of the computers available in comparison with the US, the most digitalized country in our sample. Moreover countries like Spain and Italy have important deficiencies in connectivity terms of people and firms. These issues make it difficult to implement a business model based on increasing intangible digital products in a PSS. It identifies the need for industry managers to lobby governments, in our case Spanish and Italian governments, to foster policies that stimulate technological improvement within firms and individuals. This is not the case of countries like the Netherlands, Germany or Japan, which have similar technological infrastructures as the US. Their business model challenge is still acute, and calls for industry managers to transform the balance of their product service system. Those countries with English as a first language and an English legal origin have a lower degree of measured business model challenge that requires future research, analysing in greater depth the cultural enablers and barriers present.

The empirical approach estimates consumer demand for tangible and intangible products based on logistic regressions for an extensive sample of more than 18,000 individuals. The models have a limited explanatory capacity when important explanatory factors are unobserved. To some extent this is the case here, as survey data available remains silent on some important factors that at a theoretical level form part of the value-in-use of the consumer as it is reflected in Figure 4.2. Future research must analyze with more precision consumer demand for tangible or intangible offerings introducing pertinent measures for consumer value of technology, ecology, tradition and position.

Analysis here is based on 2010 data but in 2012 according to IFPI (2012) the music industry reaches an inflection point, changing to a path of revenue growth. This was based on the introduction of new formats, including streaming services. This is an example of the iterative and dynamic nature of consumer demand and industry PSS. This dynamism was not dealt with in this thesis as the data used is cross-section. In this regard, future research must analyze how PSS transforms and evolves over time and with changing contexts and consumer demand. In particular we will study how the PSS has changed since 2010, and look for insight into the success of strategy based upon PSS offer and infrastructure developments across different counties over time.

# CHAPER 5
# GENERAL CONCLUSIONS

These PhD analyses problems related to music industry performance, which can be certainly extrapolated to other creative industries such as cinema or books. The first sections is a general introduction and presents a theoretical benchmark model which compares the competitive situation of the music industry before and after the appearance of the P2P networks such as Napster in 1999. Whereas the high concentration of the music industry before P2P makes it reasonable to assume that the industry follows monopolistic patterns, this monopolistic structure has been transformed into a duopoly under price competition for non-homogeneous products, presented in the prior literature as the Bertrand duopoly equilibrium. In this scenario offerings become more complex and companies need proactive consumer engagement with product content and format. This dialogue with their customers is a phenomenon called value co-production (Normann and Ramírez, 1993; Prahalad and Ramaswamy, 2000) and according to recent evidence 60% of music consumers may be involved in those activities (Parry et al. 2012). Regardless of this co-production of content consumers seem to substitute legal files for illegal downloads, a phenomenon described by Liewbowitz (2006) as purchase substitution. In the Chapter 2 it is quantified the scale of illegal file sharing activity across the 10 countries for which we could have access to extensive survey data covering more than 44,000 data points. It is found that on average 28.2% of the population usually participates in the file sharing networks, with a minimum of 14% in Germany and a maximum of 44% in Spain. In addition, a

negative and strong correlation between file sharing and sales per capita is found, supporting most of the previous empirical research on the area using survey and aggregated data (Liebowitz, 2008, Hong, 2004; Rob and Waldfogel, 2004; Zentner, 2006) and contradicting some recent research exploiting internet registry information (Oberholzer and Strumpf, 2007; Aguiar and Martens). The third chapter builds upon transaction cost theory and the economics of property rights and identifies two possible explanations as to why illegal file sharers may also make purchases: Sample exposure and respect for property rights. Sample exposure implies that file sharers are sampling the market using illegal means before purchasing. Respect for property rights makes reference to those file sharers that guilt compels them to make a purchase. On the other hand, those file sharers that believe internet information is free and do not have any feel of guilty, described in this PhD dissertation as *Robin Hoods*, are not going to make legal purchases. In broad terms the empirical evidence provided corroborates the presence of both effects.

This PhD dissertation also wants to highlight that not all the decrease in sales is explained by piracy. With the digitalization of music the dynamics of the music market have dramatically changed and new business models arise. Most of them focus on the understanding of music as a service (Parry et al., 2012), like for instance pay as you go (*itunes*) or pay monthly (*Spotify*). The speed of this process could fit to some consumers, but it also may exclude some others. This process is named in this paper as Business Model Problem and according to our analysis in Chapter 2 22.5% of potential music consumers worldwide are not purchasing due to this reason. In order to recover those consumers industry managers need to integrate new technologies to sales channels to configure the appropriate product and service portfolio for customers (Bustinza et al., 2011). After an effective positioning in the new markets arise from the

servitization process, firms need to determine the appropriate value offerings for customers and the adequate value relationship proposition to create value again (O'Cass and Ngo, 2010). Music distributors have made an important effort to study consumer insights aware of the new servitization context (Neely, 2008). In the chapter 4 we exploit the demand and supply information available. We conceptualize the tangible and intangible resources as a product-service system with predatory nature, which permits to evaluate whether consumers understand the epistemological shift from product to service. According to our results in all the countries analyzed we find that there is a lack of digital supply, which means that industry needs to move faster in the format transition to a more digitalized context. This is very instructive for mangers. However, results provided need some caution since we acknowledge limitations, for example the dataset was collected in 2010, when the transition product to service still had to overcome important stages like for example the streaming era.

The good academic reader will appreciate that there are different underpinnings surrounding the PhD dissertation, especially in chapters 3 and 4. From economic theories (i.e. transaction costs, property rights) to managerial literature (resource based view and servitization). This comprehensive view is an academic contribution that opens the possibility for new research on creative industries. Finally, the results throughout the PhD dissertation are valuable for policy makers and industry managers, especially those related on piracy. From the results we strongly encourage politicians to strength regulation on intellectual property rights on internet and especially to invest in media campaigns to influence the individual beliefs on internet usage.

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