

## **Price-concentration analysis**

### **Introduction**

1. This appendix presents the results of the price-concentration analysis for the GAME/Gamestation inquiry.
2. The basic intuition of a price-concentration analysis is that higher levels of concentration in a market (or area of supply) may be associated with greater market power. Greater market power may, in turn, be associated with higher prices, so higher levels of concentration might coincide with higher prices.
3. Our analysis of Gamestation prices indicates that the number of rivals located close to a Gamestation store affects its prices for mint console games two weeks after their release. This analysis has not found evidence of a relationship between prices of mint games 20 weeks after their release, pre-owned and trade-in games and the number or types of local competitors.
4. The remainder of the appendix is structured as follows. The following section discusses the methodology and the data relating to competitors, products and prices. We then discuss the analysis of the relationship between prices and concentration using tabular, graphical, and econometric methods.

### **Methodology and data used**

5. Our analysis relates the level of concentration around a sample of around 100 Gamestation stores to the prices charged in these stores. We did not carry out the same analysis for GAME stores as GAME told us that it set national prices. Gamestation provided a list of competitors encompassing supermarkets, specialist

retailers, high street retailers and computer and electrical goods retailers.<sup>1</sup> We carried out our own analysis to determine the number of local competitors. Gamestation also provided store-level data of mint, pre-owned and trade-in value and volume of sales of individual console games.

### ***The size of local areas considered***

6. Our analysis considers different-sized areas around Gamestation delineated by radii of 0.5 miles, 1, 2.5 and 5 miles. Within these areas, we count the number of competitors (detailed in paragraph 10) to derive an indication of the level of concentration.

7. Table 1 lists the size of the area covered by the various radii.

TABLE 1 **Radii and the areas they cover**

<i>Radius miles</i>	<i>Area covered sq miles</i>
0.5	0.8
1.0	3.1
2.5	19.7
5.0	78.8

Source: CC analysis.

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### ***The products considered***

8. Our analysis considers four different baskets of console gaming software. Each basket includes prices<sup>2</sup> of 14 different games.<sup>3</sup> The first basket consists of mint prices of high-selling games two weeks after their launch. We consider that these games are likely to be sold by all retailers, including supermarkets, and high street retailers like HMV and Virgin.

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<sup>1</sup>Gamestation provided a list of competitors. We checked the list of independent retailers and found that some of the retailers on the list did not sell mint or pre-owned games. We adjusted the list accordingly.

<sup>2</sup>We explain the price measure used in paragraphs 12 to 15 below.

<sup>3</sup>All 14 games were among the 50 top-selling games in 2006. Further, all games were published approximately during the same time (October to November 2006). This was to ensure that there is no time-related variation in prices. Those 14 games that formed part of our analysis were *all* games that fulfilled these criteria and that we had data on (where prices are available, ie value and volume sales were recorded).

9. The second basket consists of prices of high-selling mint games 20 weeks after their launch. We consider that these games are less likely to be stocked by supermarkets and more likely to be stocked by specialist retailers. The final two baskets consist of prices of pre-owned and trade-in games ten weeks after the launch of the corresponding mint versions.

### ***The set of competitors considered***

10. Gamestation indicated that it competes against the following bricks-and-mortar retailers:
  - (a) specialist gaming retailers such as GAME, Blockbuster, ChoicesUK, and independent retailers;
  - (b) high street retailers such as Argos, HMV, Virgin, WH Smith, and Woolworths;
  - (c) supermarkets such as Asda, Morrisons, Sainsbury's, and Tesco; and
  - (d) computer and electrical goods retailers such Comet, Currys, and PC World.These were therefore incorporated into our analysis.

### ***The price measure considered***

11. As discussed in Appendix C, Gamestation stores can vary prices on some mint products to match any local competitor. Additionally, these stores offer a price-matching guarantee on customer request. Therefore, we tested the extent to which its prices varied and the extent to which any variation in price may be related to different levels of local concentration.
12. For the purpose of our analysis we have used the average selling price (ASP) which was derived by dividing the value of sales by sales volume.

13. ASPs might vary across stores for two reasons. If the take-up of promotional bundle<sup>4</sup> offers differs across stores, ASPs will differ. However, we consider this variation to be essentially random.<sup>5</sup> The second reason why ASPs might differ across stores is because of local pricing decisions. These variations might be systematically related to the level of concentration around stores.
14. The parties argued that the ASP measure will provide a misleading representation of the true selling price faced by the customer. They put to us that the ASP for each product may vary across stores according to the take-up of the various bundle offers which they illustrated using GAME sales data for the first 12 weeks of release of *Call of Duty*. They further argued that this variation is unlikely to occur in a random way and that this might render our results biased. Specifically, they argued that the take-up of the various bundle offers will be a function of local demographics.
15. We have addressed the parties' concern in two ways. First, in our econometric approach we have considered various socio-demographic variables as explanatory variables to account for the impact that consumer heterogeneity may have on our analysis. However, including these variables has had only a minor impact on our parameter estimates. Second, as well as using ASP, we have carried out our analysis using price data for solus transactions (see paragraphs 44 to 47).<sup>6</sup>

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<sup>4</sup>Promotional bundle offers include instances where a title has been sold as part of a bundle with an item of hardware, an accessory, or other software titles in a multi-buy.

<sup>5</sup>In econometric terminology, we assume that this variation is part of a random error term.

<sup>6</sup>These are transactions in which titles were sold separately (ie they were not bundled).

## Variation in prices

16. We have constructed price indicators for the analysis of local variation in prices.<sup>7</sup> One of the games that formed part of the price indicators is called *Call of Duty*. During the first weeks after its release, the Xbox 360 (Xbox) version of the game sold approximately [X] copies worth £[X] across a sample of 100 Gamestation stores. The Xbox version of *Call of Duty* was the [X] selling game across Gamestation stores in 2006.
17. Figure 1 illustrates the distribution of *Call of Duty*'s ASP across the approximately 100 stores that are part of our sample.

FIGURE 1

### Observed average selling prices *Call of Duty*

[X]

Source: Gamestation, CC analysis.

18. Figure 1 illustrated that ASPs for this particular game ranged between £[X] and £[X] two weeks after its release. The most frequently observed ASP was £[X] with [X] observations. ASPs closer to either end of the scale, ie £[X] or £[X], were observed less frequently.
19. A common measure of (price) dispersion is called standard deviation. It measures how widely observations are dispersed around the variable's mean. The standard deviation of *Call of Duty*'s ASPs was £[X], or about [X] per cent around its mean value.

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<sup>7</sup>We computed price indicators following three simple calculations. First, we compute the average price of a particular game across all stores. Second, we calculate the percentage difference between each store's price and the average price for that particular game. We repeat this calculation for a number of different games. Lastly, we combine stores' price indicators for different games by weighting them together into one single figure for each store. The resulting price indicator measures the extent to which a store's prices are above or below the average price for the chosen basket of games. A price indicator taking the value of zero indicates that this store's prices are not different from the average. In contrast, a price indicator of, for example 10 (-10) indicates that this stores' prices are 10 per cent above (below) the average.

20. The ASPs of all 14 games we consider in this analysis exhibit some degree of variation. The standard deviation in ASP ranges between [X] and [X] per cent of the mean price. This compares with [X] per cent in the above example. As noted in paragraph 13 above, the variation in ASPs may reflect differences in list price or differences in the proportions of sales made as part of promotional deals. We present summary statistics for all games in our sample in Annex 1 using both ASP and prices related to solus transactions alone which are also shown to vary for the same title across different stores.

### Price concentration analysis

#### *Prices and concentration: a tabular analysis*

21. One way of assessing whether higher levels of concentration are associated with higher prices is to calculate and compare ASPs in areas with various numbers of competitors.

22. Table 2 shows average price indicators for various radii and various levels of concentration. The radii considered range from 0.5 to 5 miles. Concentration is measured using bands of 0–5 competitors, 6–10, 11–20, 21–40, and more than 40 competitors.

TABLE 2 Volume-weighted average price indicator of mint games two weeks after their release

Number of competitors within x miles	miles			
	0.5	1	2.5	5
Fewer than 6	( X )			
Between 6 and 10				
Between 11 and 20				
Between 21 and 40				
More than 40				

Source: Gamestation, CC analysis.

23. Reading the above table from top to bottom suggests that ASPs of mint games two weeks after their release tend to be lower in areas with a larger number of

competitors. For example, if there are fewer than [X] competitors within a 0.5 mile radius around Gamestation stores, ASPs are [X] per cent higher than the average. This number falls to [X] per cent in areas with between 6 and 10 competitors. As the number of competitors increases further to between 11 and 20 within a 0.5-mile radius, ASPs are [X] per cent lower than the average.

24. Reading Table 2 from left to right suggests that ASPs of the same games tend to be lower when a given number of competitors are spread across a smaller area. For example, where there are between six and ten competitors within a 0.5-mile radius, ASPs are, on average, [X] per cent higher than the average. This number increases to [X] per cent when the same number of competitors is spread across a wider area within a 1-mile radius. If between six and ten competitors are spread across an area of a 5-mile radius, ASPs are, on average, [X] per cent higher.
25. However, the observation that a certain number of competitors have a weaker effect on ASPs the further they are spread around the base store is not as systematic as the finding that higher concentration within a given area is associated with higher ASPs.
26. Overall, Table 2 suggests that for ASPs of mint games two weeks after their release, the higher the number of competitors the lower the ASP.

### ***Prices and concentration: a visual analysis***

27. Another way of illustrating the relationship between ASPs and concentration is to display these two variables on the same scatter diagram.
28. Figure 2 relates number of competitors, measured on the horizontal axis, to the price indicator for mint games two weeks after their release, measured on the vertical

axis.<sup>8</sup> Every cross in that figure relates to one Gamestation store. For example, one of the circled crosses in Figure 2 relates to store A. This store faces two competitors with a 0.5-mile radius and realizes an ASP that is approximately [✂] per cent above the average. On the other side, store B faces 17 competitors and realises an ASP that is approximately [✂] per cent below the average.<sup>9</sup>

FIGURE 2

**Relationship between prices and concentration:  
all competitors within a 0.5-mile radius, prices two weeks after release**

[✂]

Source: Gamestation, CC analysis.

29. Fitting a straight line through the observations displayed in Figure 2 suggests that there is a negative correlation between ASPs and the number of competitors.
30. Repeating the same analysis but relating the number of competitors to ASPs of mint games 20 (as opposed to two) weeks after their release shows a similar but weaker relationship between these two variables.
31. We have also observed that there is a significant degree of variation around price indicators that does not appear to be related to the number of competitors.

***Prices and concentration: an econometric analysis***

32. Our econometric model relates prices to the number of competitors within a 0.5-mile radius and around each Gamestation store. To minimize any distortions from the use of price indices and to increase our sample size, we use prices of all products in all stores to construct our dependent variable, and we allow for product-specific

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<sup>8</sup>A price indicator taking the value of zero indicates that this store's prices are not different from the average. In contrast, a price indicator of, for example 10 (–10) indicates that this store's prices are 10 per cent above (below) the average.

<sup>9</sup>These values for stores A and B refer to individual, illustrative examples of stores. The figures do not refer to the average price indicator for all stores facing a particular number of competitors (averages for the price indicator across all stores are instead shown in Table 2).

variation in prices using a dummy variables approach. We explain our approach in a more detail in Annex 2.

33. We also consider several additional explanatory variables, such as store size and socio-demographic variables, which may affect our price variable in addition to the impact of local competition. We use two socio-demographic variables. One is the proportion of the population that belongs to D and E socio-economic groups. The other variable is the proportion of the population under the age of 35.
34. One potential problem we face is that there may be some unobserved heterogeneity across different geographic areas (eg price elasticity of demand) that affects both the pricing and entry decision. This means that our explanatory variable may be endogenous and that the estimates of a simple Ordinary Least Squares (OLS) regression may be biased.
35. We employed the instrumental variable (IV) technique to alleviate this problem. In particular, we use the population living in a specific geographic area as an instrument for the number of rival stores. In principle, we would expect rivals to locate stores in areas with a large population. In Annex 2 we present the results of the statistical analysis which support this conjecture.
36. The parties criticized our use of the instrumental variable approach. In particular, they pointed out that in insufficiently large samples, the use of an instrument that is not very highly correlated with the endogenous variable can render the coefficients in the main regression to be biased.

37. We note that our sample size is large—it contains approximately 1,350 observations—and that our instrument is sufficiently strong given that it correlates with the endogenous variable at the rate of 0.49.
38. On the basis of what Gamestation told us about its pricing policy and its internal pricing documents, we do not believe that the population is an explanatory variable in its own right which would undermine our approach.
39. Table 3 displays estimated coefficients of two econometric models—one from the OLS regression and the other from the IV regression—which relate logarithm of prices (ASP) of mint games two weeks after their release to the number of rivals within a 0.5-mile area, the set of game-specific dummy variables and our control variables described in paragraph 33. For full results see Annex 3.<sup>10</sup>

TABLE 3 **Econometric analysis: dependent variable logarithm of prices (ASP) of mint games two weeks of their release**

<i>Explanatory variable</i>	<i>Impact on price %</i>	
	<i>OLS estimate</i>	<i>IV estimate</i>
All stores selling gaming products within a 0.5-mile radius	-0.20*	-0.38*

Source: Gamestation, CC analysis.

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\*Statistically significant at the 5 per cent level of significance.

40. Both the OLS and the IV are statistically significant at the 5 per cent significance level. The OLS estimate suggests that the presence of one additional competitor store selling gaming software within a 0.5-mile radius from a Gamestation store reduces its ASPs of mint games two weeks after their release by approximately 0.2 per cent.

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<sup>10</sup>The parameter estimates on socio-demographic variables were not statistically significant.

41. The IV estimate suggests that the presence of one additional competitor store reduces Gamestation's ASPs by about 0.38 per cent. The IV estimate is greater (in absolute) by about factor of two which suggests that the OLS approach may understate the true negative impact of the number of local competitors on Gamestation ASPs.
42. Using a similar approach, we also tested the effect of rival stores on Gamestation's ASPs for mint games 20 weeks after their release, and pre-owned and trade-in games ten weeks after the launch of the corresponding mint versions. We also estimated our models for radii of 1, 2.5 and 5 miles. However, none of these models yielded results that are statistically significant.
43. Next we focus our attention on the merging parties. Our approach here is to consider difference in prices of Gamestation stores when there are no competitor GAME stores within a 0.5-mile radius and the prices of stores when there is at least one competitor GAME store within a 0.5-mile radius. Again we present both the OLS and the IV estimates. For full results, see Annex 3.

TABLE 4 Econometric analysis: dependent variable logarithm of prices (ASP) of mint games 20 weeks of their release

<i>Explanatory variable</i>	<i>Impact on price</i> %	
	<i>OLS estimate</i>	<i>IV estimate</i>
Presence of one or more GAME stores within a 0.5-mile radius	-1.48*	-4.14*

Source: Gamestation, CC analysis.

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\*Statistically significant at the 5 per cent level of significance.

44. Both the OLS and the IV estimate are statistically significant. A comparison of the results from the two regressions indicates that the effect of the number of GAME stores within a 0.5-mile radius is greater using the IV approach. The OLS estimate suggests that ASPs are about 1.5 per cent lower in those areas where there is at

least one GAME store. The IV estimate is greater by factor of almost three—it suggests that the presence of at least one GAME store reduces Gamestation’s ASPs by about 4.1 per cent.

45. We repeat the analysis underlying the results in Table 4 but this time using price data for solus transactions. The advantage of this data is that it does not include bundled deals.<sup>11</sup>

TABLE 5 **Econometric analysis: dependent variable logarithm of prices (solus transactions) of mint games two weeks of their release**

<i>Explanatory variable</i>	<i>Impact on price %</i>	
	<i>OLS estimate</i>	<i>IV estimate</i>
Presence of one or more GAME stores within a 0.5 mile radius	-2.39*	-2.16*

Source: Gamestation, CC analysis.

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\*Statistically significant at the five per cent level of significance.

46. The results suggest that Gamestation’s prices are just over 2 per cent lower in those areas where there is at least one GAME store. We also tested the effect of GAME stores on Gamestation’s ASPs for mint games 20 weeks after their release, and pre-owned and trade-in games ten weeks after the launch of the corresponding mint versions. We also estimated our models for radii of 1, 2.5 and 5 miles. However, none of these models yielded results that are statistically significant.

47. Both sets of results (ASP and solus) suggest that there is a statistically significant relationship between Gamestation’s prices and the presence of one or more GAME stores within the 0.5-mile radius. The estimates using solus data are smaller (by

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<sup>11</sup>The parties claimed that even the solus data may give misleading results because nationally determined price changes can take place within a given week, and therefore variation in the weekly averages across stores may occur simply due to differing sales patterns across the week (ie some stores may sell a higher proportion of volumes for that week before the price change than other stores). However, we have found no evidence that this variation occurs in a systematic fashion so as to influence our results.

about factor of almost two). This may reflect a departure from the assumption of random variation in the take-up of promotional bundle offers across different stores. However, it is also possible that by focusing on solus transactions we may have underestimated the strength of the relationship between local pricing and the presence of competitors if Gamestation is matching bundles offered by competitors on customer request (ie promotions and bundles may themselves be a feature of local competition).<sup>12</sup>

48. Overall, the results are consistent with the information provided by Gamestation on its pricing practices, showing some variation between stores in mint pricing shortly after product release, reflecting the identity of local competitors and its price-matching guarantee, although the price effects identified are small. No such reflection was found in an analysis of price variation for older or pre-owned games.
49. The parties argued that pricing differences between stores were not consistent with these results; they claimed that the three Gamestation stores for which there is data for all 14 products which did not face GAME stores often have average prices lower than many facing stores.<sup>13</sup> However, we have examined the prices charged by the stores they identified for mint games two weeks after their release and we found that prices in these stores tended to be higher than the corresponding averages across all stores. Furthermore, we note that in our sample there are 12 non-facing stores and the fact that nine of them may not sell all 14 titles does not disqualify them from the analysis. Consequently we were unpersuaded by the parties' analysis.

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<sup>12</sup>Although promotions including bundle deals were applied nationally, Gamestation's local price match policy applied to bundle deals too.

<sup>13</sup>In our sample there are 12 non-facing stores but the parties did not provide similar price comparisons for the 9 of them that did not sell all 14 titles.

**Summary price statistics: sample titles two weeks from release**

Title	Need For Speed Carbon	Canis Canem Edit	Pro Evolution Soccer 6	WWE Smackdown vs Raw 2007	Fifa 07	Call of Duty 3	Fifa 07	Gears of War	Tom Clancy's Rainbow Six Vegas	Call of Duty 3	Zelda Twilight Princess	Pro Evolution Soccer 6 Classic	WWE Smackdown vs Raw 2007	Red Steel
Solus and bundled														
Average (£)														
STDEV														
STDEV (as % of average)														
Solus														
Average (£)														
STDEV														
STDEV (as % of average)														

Source: Gamestation, CC analysis.

## Technical annex

### Econometric model

1. The empirical analysis of the relationship between store level prices and the number of competitors is based on the following model:

$$P_{jk} = \alpha + \beta C_j + \sum_k \phi_k G_k + \Gamma X_j + \varepsilon_{jk}, \quad \dots(1)$$

where  $P_{jk}$  is the logarithm of price of game  $k$  in shop  $j$ ,  $G_k$  is dummy variable that takes the value of 1 for game  $k$  and zero otherwise and  $C_j$ <sup>1</sup> is the number of competitors within a 0.5-mile radius from a Gamestation store.

2. The vector  $X$  contains additional explanatory variables, such as store size and socio-demographic variables which may affect our price variable other than local competition. We use two socio-demographic variables. One is the proportion of the population that belongs to D and E socio-economic groups. The other variable is the proportion of the population under the age of 35. We measure the population characteristics at the level of store postcodes.
3. The parameter estimate  $\beta_1$  is of prime interest as it will provide an indication of the effect of an additional rival store located within a 0.5-mile radius on store prices. In order to account for a cluster structure of our data, we have used a robust estimator of variance.

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<sup>1</sup>In the version of the model which uses a binary indicator rather than the count of competitors,  $C_i$  equals 1 if competitor  $i$  has one or more stores within a half-mile radius from Gamestation Store and 0 otherwise.

## Instrumental variable approach

4. One problem we face is that there may be some unobserved heterogeneity across markets (eg price elasticity of demand) that affects both the pricing and entry decision. This means that our explanatory variable may be endogenous and that the estimates of a simple OLS regression may be biased.
5. The endogeneity problem can in principle be addressed by employing instrumental variable techniques. In our case, this requires finding instrumental variables that are correlated with the number of competitors but are unrelated to the error term in (1).
6. One variable which we believe satisfies these two conditions is the total population within the relevant geographic area. We expect this variable to be correlated with the number of rivals in a geographic area since areas with a large population tend to support a greater number of stores.
7. Table 1 shows the correlation coefficients between the logarithm of population and our potentially endogenous explanatory variable in the two regressions.

TABLE 1 **Correlation coefficients**

<i>0.5 mile radius around Gamestation store</i>	<i>Log of population</i>	<i>All stores selling gaming products</i>	<i>Presence of one or more Game stores</i>
Log of population	1.000		
All stores selling gaming products	0.645	1.000	
Presence of one or more Game stores	0.489	0.495	1.000

Source: Gamestation, CC analysis.

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8. As it can be seen, there is a fairly strong linear relationship between our potentially endogenous explanatory variable from each of the regressions and the logarithm of population which is our chosen instrumental variable.

9. We have also estimated a regression of our potentially endogenous variable on our instrument and other exogenous variables. From this regression we obtained an F-statistic of about 30. This is well in excess of a value which would be a sign of a finite-sample bias.
10. On the basis of what Gamestation told us about its pricing policy, and its internal documents, we do not believe that population should be an explanatory variable in its own right which would question our approach.

### **Omitted variable bias**

11. The parties have also raised the possibility that our analysis suffers from an omitted variable bias. In particular, they suggested that we failed to control for the presence or otherwise of other competitors in our regression analysis and that this may be reflected in the pattern of regression residuals.
12. We note that we have considered all competitors in the round in Table 3 but found that their impact on Gamestation's prices is negligible. Furthermore, we have used an instrumental variable estimator which is a general approach to control for endogeneity.
13. We note that the regression residuals are clustered in several groups which appear to have different variance and that this pattern is indicative of heteroskedasticity. This suggests that the OLS estimator of standard errors may be inefficient. We have addressed this problem by employing a robust estimator of variance.

## Full regression results

TABLE 1 **Econometric analysis: dependent variable logarithm of prices (ASP) of mint games two weeks of their release**

<i>Explanatory variable</i>	<i>Impact on price %</i>	
	<i>OLS estimate</i>	<i>IV estimate</i>
All stores selling gaming products within a 0.5-mile radius	-0.20*	-0.38*
Logarithm of store size	-0.01*	-0.01
Under age of 35 as proportion of the total shopper population	0.07	0.09
A and B socio-economic group as proportion of the total shopper population	0.04	0.03

Source: Gamestation, CC analysis.

\*Statistically significant at the 5 per cent level of significance.

TABLE 2 **Econometric analysis: dependent variable logarithm of prices (ASP) of mint games two weeks of their release**

<i>Explanatory variable</i>	<i>Impact on price %</i>	
	<i>OLS estimate</i>	<i>IV estimate</i>
Presence of one or more GAME stores within a 0.5-mile radius	-1.48*	-4.14*
Logarithm of store size	-0.01*	-0.01
Under age of 35 as proportion of the total shopper population	0.04	0.04
A and B socio-economic group as proportion of the total shopper population	0.02*	0.02

Source: Gamestation, CC analysis.

\*Statistically significant at the 5 per cent level of significance.

TABLE 3 **Econometric analysis: dependent variable logarithm of prices (solus) of mint games two weeks of their release**

<i>Explanatory variable</i>	<i>Impact on price %</i>	
	<i>OLS estimate</i>	<i>IV estimate</i>
Presence of one or more GAME stores within a 0.5-mile radius	-2.39*	-2.16*
Logarithm of store size	0.00	-0.01
Under age of 35 as proportion of the total shopper population	0.01	0.01
A and B socio-economic group as proportion of the total shopper population	-0.01	-0.04

Source: Gamestation, CC analysis.

\*Statistically significant at the 5 per cent level of significance.